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The New Encyclopædia Britannica

PROPÆDIA

Outline of Knowledge
and
Guide to the Britannica

How to use the PROPAEDIA

As its title indicates, the PROPAEDIA, or Outline of Knowledge, is intended to serve as a topical guide to the contents of the *Encyclopædia Britannica*, enabling the reader to carry out an orderly plan of reading in any field of knowledge or learning chosen for study in some depth. The PROPAEDIA's table of contents gives the reader an overview of the Outline of Knowledge as a whole; the introductory essays for each of the ten parts illuminate the major concerns of that part of human knowledge; the headnotes that are affixed to parts and divisions prepare the reader for examination of the subjects being covered there; and the outlined presentations of these subjects, with their lists of related article titles, enable the reader to carry on a course of study that may be more or less extensive and detailed in accordance with individual interests and desires.

Structure. Each of the 10 parts, 41 divisions, and 177 sections that make up the PROPAEDIA is marked in the table of contents by a heading, which is followed by the number of the page on which that unit of the PROPAEDIA begins. This structure provides three ways to utilize the outline: (1) one may turn to any of the parts as a whole and examine the contents of that part; (2) one may select a particular division of a part and examine the contents of that division; or (3) one may focus on a single section or several sections of such a division and examine the contents of that section or those sections.

Sectional outlines. The sectional outlines present, in an orderly arrangement of topics, subjects that are treated in articles in the MACROPAEDIA and MICROPAEDIA. Each section number incorporates the numbers of the part and division to which it belongs. For example, Section 725 is the fifth section in Part Seven, Division II; Section 96/10 is the tenth section in Part Nine, Division VI. In each sectional outline the major subjects are indicated by

capital letters ("A," "B," etc.). There are always at least two major subjects, but there may be many more in a given section. When it is necessary to subdivide a major subject, up to three additional levels may appear in the outline; the first is indicated by Arabic numerals, the second by lowercase letters, and the third by Roman numerals, as shown below:

B. Metallurgy

1. Mineral processing: crushing and grinding of ores, concentration of metallic minerals
2. Extractive metallurgy: separation of metallic elements from mineral form
 - a. Pyrometallurgy: processes that involve the use of heat
 - i. Roasting: oxidizing, reducing reactions
 - ii. Smelting: processes for removing molten metal from molten slag

The INDEX, with its alphabetically arranged subject headings, is indispensable in finding where a given subject appears in the Outline of Knowledge. These headings, where appropriate, carry specific citations pointing to the part, division, or section of the PROPAEDIA that covers the subject in question. A subject referred to in a sectional outline is, in many cases, treated fully in an article of the same title in the MACROPAEDIA or MICROPAEDIA, each such title being included in the list of suggested reading at the end of the section. These titles, as well as significant references to the subjects in other contexts, are cited in the INDEX. It may be helpful to compare the functions of the PROPAEDIA and the INDEX: Both are guides to the contents of the *Encyclopædia Britannica*, but the PROPAEDIA's primary purpose is to indicate *what* subjects are covered, while the INDEX's primary purpose is to indicate *where* they are covered.

THE CIRCLE OF LEARNING

"The alphabetical system of arrangement," observed the Editors of the Eleventh Edition of the *Encyclopædia Britannica* (1910–11), "with its obvious advantages, necessarily results in the separation from one another of articles dealing with any particular subject." Consequently, "the student who desires to make a complete study of a given topic must exercise his imagination if he seeks to exhaust the articles in which that topic is treated." This result is certainly a serious defect in the system for anyone who feels—as did the Editors of the Eleventh Edition—that an encyclopaedia should not be merely a "storehouse of facts," but should also be "a systematic survey of all departments of knowledge." To remedy this defect, the Editors constructed a "Classified Table of Contents," which they believed to be "the first attempt in any general work of reference at a systematic subject catalogue or analysis of the material contained in it."

Remarkable as it was at the time, that Table of Contents did not fully succeed in achieving its objective of overcoming the defects of an alphabetical organization of encyclopaedic articles by means of a topical presentation of their content. A quick glance at the 24 major categories into which the Table of Contents was divided will reveal that the alphabet was still the thread on which the parts were strung: I. Anthropology and Ethnology; II. Archaeology and Antiquities; III. Art; IV. Astronomy; V. Biology; VI. Chemistry; VII. Economics and Social Science; VIII. Education; IX. Engineering; X. Geography; XI. Geology; XII. History; XIII. Industries, Manufactures and Occupations; XIV. Language and Writing; XV. Law and Political Science; XVI. Literature; XVII. Mathematics; XVIII. Medical Science; XIX. Military and Naval; XX. Philosophy and Psychology; XXI. Physics; XXII. Religion and Theology; XXIII. Sports and Pastimes; XXIV. Miscellaneous. In each of these categories, the only further subdivisions involved the distinction of general from particular subjects, and the distinction of both of these from biographical entries. Under each of these headings, titles of the encyclopaedia's articles were listed in strictly alphabetical order.

In planning this Fifteenth Edition of *Encyclopædia Britannica*, the Editors, while deciding to retain the alphabetical ordering of the articles in the set, sought to improve upon the effort that their predecessors had made to overcome the defects of an alphabetical organization by giving the reader a truly topical, and totally nonalphabetical, Table of Contents. It would

serve the purpose that the Editors of the Eleventh Edition had in mind, which was to enable the reader to "make a complete study of a given topic"—that is, a department of knowledge or field of learning.

It may be asked why it was not thought better to abandon the alphabetical principle entirely and construct a purely topical encyclopaedia, in which all the articles would be assembled, volume after volume, according to some general schema for the organization of human knowledge. The answer is twofold. First, a purely topical organization of the articles themselves cannot avoid the appearance of a certain tendentiousness or arbitrariness in the editorial commitment to one rather than another organizing schema or set of principles. The reader is, therefore, provoked to ask: Does this order, volume by volume and article by article, reflect the only right or proper exposition of the whole of human knowledge?

Second, a purely topical encyclopaedia provides its readers with only one mode of access to its contents. This may be alleviated somewhat, perhaps, by the addition of an alphabetical index; but an index, by its very nature, serves the purpose of enabling the reader to look up *particular* items of information; it does not provide a general and systematic mode of access to the contents of the encyclopaedia.

The basic plan of the new *Britannica*, therefore, aims to give its readers access to its contents by both the topical and the alphabetical modes. General and systematic topical access is provided by the Outline of Knowledge contained in this volume, called the "Propædia" because it is a kind of preamble or antechamber to the world of learning that the rest of the encyclopaedia aims to encompass. Alphabetical access is provided not only by the two-volume Index but also by the alphabetical ordering of the short articles in the Micropædia.

Unlike the Classified Table of Contents in the Eleventh Edition, which was alphabetically organized by categories and subjects, the Outline of Knowledge in this Fifteenth Edition is a purely topical presentation of the subjects covered in the articles to be found in both the Macropædia and the Micropædia. It is, therefore, reasonable to ask how such a purely topical outline of encyclopaedic content avoids the tendentiousness or arbitrariness that is attributable to an encyclopaedia in which the articles themselves are topically rather than alphabetically arranged. Does not the Outline of Knowledge here presented reflect, perhaps even con-

ceal, a commitment to one set of organizing principles rather than another? Does it not embody biases or preconceptions that are not universally acceptable?

It is hardly possible to say “No, not at all” to these questions. Two points, however, can be made affirmatively that tend to reduce or alleviate whatever degree of arbitrariness remains unavoidable in a topical outline of the whole of human knowledge. One is that the Outline of Knowledge, while conceived by the Editors, was constructed and corrected in the light of detailed recommendations, directions, and analytical contributions from scholars and experts in all the fields of knowledge represented. A list that includes the advisers who worked with the Editors in the construction of the Outline of Knowledge follows Part Ten of the Propædia.

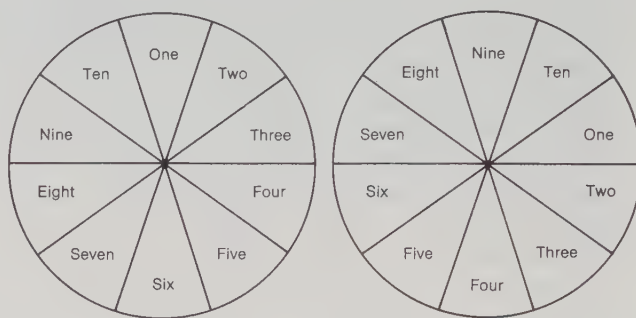
The second point is that the Outline of Knowledge is conceived as a circle of learning. To say that the contents of an *en-cyclo-pædia* form a circle of learning is more than a literal transliteration from Greek to English. In Greek or English, reference to the circle introduces a powerful metaphor, the understanding of which should help the reader to overcome whatever arbitrariness still resides in the Outline of Knowledge in spite of determined efforts on the part of all concerned to minimize this defect. A circle is a figure in which no point on the circumference is a beginning, none is a middle, none is an end. It is also a figure in which one can go from any point, in either direction, around the circumference; in addition, one can go across the circle from any point to any other; or, by any number of transecting lines, starting from a given point, one can go to any number of other points on the circumference, near or far.

The 10 parts into which the Outline of Knowledge is divided are disposed not along a finite straight line beginning at this point and ending at that; they are disposed rather as segments of the circle. While it is true that, in this arrangement, one part may lie next to another and at some distance from still another, it is also true that, since the circle can rotate around its axis, any one of the 10 parts may be regarded as standing at the top of the circle, or at the left or right side of it, or at the bottom. In other words, with the circular arrangement of the parts, and with the rotation of the circle, the reader can begin anywhere in the circle of learning and go to adjacent parts around the circle; or, moving along interior transecting lines, the reader can go from any part across the circle to parts that are not adjacent on the circumference. This view of the Outline of Knowledge can be represented in a number of diagrams.

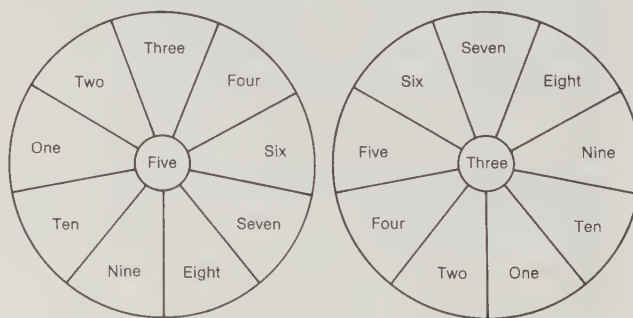
For a synopsis of the subject matter covered in each of the 10 parts of the outline, the reader is referred to that part of the Table of Contents set forth on pages 9–15 of this volume. The titles of the individual parts are given in the following list:

Part One.	Matter and Energy
Part Two.	The Earth
Part Three.	Life on Earth
Part Four.	Human Life
Part Five.	Human Society
Part Six.	Art
Part Seven.	Technology
Part Eight.	Religion
Part Nine.	The History of Mankind
Part Ten.	The Branches of Knowledge

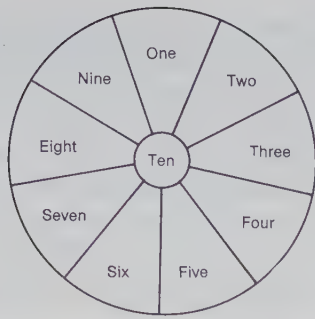
The pair of diagrams below shows the 10 parts as segments of a circle. Part One is placed at the top of the diagram to the left, and Part Nine is at the top of the diagram to the right, to illustrate the effect achieved by rotating the circle.



The second pair of diagrams, following, places one of the 10 parts at the centre of the circle with the remaining nine parts as segments of the circle formed by lines radiating from the centre. The point being made here is that any part can occupy the central position—the place in the circle of learning at which one begins, going thence in all directions to the remaining nine parts. To illustrate this, Part Five occupies the centre in the diagram to the left; Part Three, the centre in the diagram to the right.



The final diagram offers still another approach to the circle of learning. In this diagram, Part Ten occupies the central position; and here there is only one diagram rather than a pair because the reason for placing Part Ten in the central position applies to it alone and to none of the other nine parts.



The reason for this special placement of Part Ten stems from the one organizing principle to which the Editors were explicitly committed in planning and producing this new *Britannica*. Briefly stated, that principle involves a distinction between (a) what we know about the world of nature, of man and society, and of human institutions *by means of* the various branches of learning or departments of scholarship; and (b) what we know about the branches of learning or departments of scholarship—the various academic disciplines themselves. For the most part—there are a few exceptions—Parts One through Nine represent the knowledge of nature, of human society, of human institutions, and their history. In clear contradistinction, Part Ten mainly covers the disciplines themselves—the branches of knowledge or fields of scholarship—by which one inquires into, thinks about, or comes to have knowledge of the world in which he lives. Part Ten examines the nature, methods, problems, and history of the various branches of knowledge or scholarly disciplines, the actual content of which is set forth in Parts One through Nine.

Thus, for example, Section 10/34 in Division III of Part Ten examines the nature, methods, problems, and history of the biological sciences; but the knowledge of life that the biological sciences afford is outlined in Part Three. Or, to take another example, Section 10/41 in Division IV of Part Ten examines historiography and the study of history; but the actual history of mankind is outlined in Part Nine.

There are, however, three departments of learning that are exclusively treated in Part Ten—both with regard to the nature and history of the disciplines themselves and also with regard to the knowledge or understanding afforded by these disciplines. They are logic (in Division I of Part Ten), mathematics (in Division II), and philosophy (in Division V). The reason for this exceptional treatment of these three disciplines is given in the Introductory Essay to Part Ten.

The special character of Part Ten thus explains the diagram in which it occupies the centre of the circle of learning, but that must not be interpreted as attributing prime importance to it. This diagram simply indicates the special function Part Ten performs in relation to the other parts. It alone stands in close relation to all the rest; there are varying degrees of relatedness among the other parts. For example, Parts Three and Four,

dealing with Life on Earth and with Human Life, are closely related; Parts Four and Five, dealing with Human Life and with Human Society, are also closely related; but Part Four has a different relatedness to Part Three, on the one hand, and to Part Five, on the other. In the presentation of the Outline of Knowledge, the headnotes and the cross-references give the reader an indication of these interrelationships.

Anyone who is in a position to compare the classified list of articles in the Eleventh or even the Fourteenth Edition with the Outline of Knowledge will be persuaded, the Editors think, that whereas the immediately preceding editions of *Britannica* represented a 19th- and early 20th-century view of the state of human knowledge, the new *Britannica*, in its Fifteenth Edition, is an encyclopaedia that reflects the many changes and innovations in man's knowledge and understanding that are emerging at the end of this century and will continue into the next.

The reader's attention should be called to the following features of the Propædia, or Outline of Knowledge:

1. It serves as a Table of Contents for the long articles in the Macropædia and also for the tens of thousands of shorter articles in the Micropædia.
2. Each of the 10 Parts of the Outline and the several Divisions of each of those Parts is prefaced by a brief summary of the topics covered.
3. The Divisions of each Part are followed by a number of Sections in which each of the topics covered is outlined.
4. At the end of each sectional outline, there is a list of Suggested Readings, first in the Macropædia, second in the Micropædia, which is followed by a list of the biographical articles that are relevant to the subjects covered in the outline of that Section.
5. In the topical outline of each Section, cross-references are made, when relevant, to other Sections in the Propædia on which related subjects are treated.

Because it is constructed in this manner, the Propædia provides the reader who wishes to pursue the study of a whole field of knowledge with an easily used guide. The Propædia thus offers readers a more comprehensive and detailed study guide for the use of the *Encyclopædia Britannica* than has ever been furnished before.

To facilitate their use of the Propædia as a study guide, readers should turn to pages 9–15, which follow. Here they will find a synoptic Table of Contents of the Propædia itself, set forth in the order of the 10 Parts, under each of which the component Divisions are listed, and under each Division, the component Sections.

This synoptic Table of Contents gives readers an overview of the Outline of Knowledge as a whole. The introductory essays for each of the 10 Parts, each writ-

ten by an authority in that field, illuminate the major concerns of that area of human knowledge.

The Propædia, or Outline of Knowledge, helps readers answer for themselves the question that, in its most general form, is as follows: *What can I learn from the Britannica concerning one or another area of human knowledge?* More specifically, the question might be: *What can I learn about the Earth?* or *What can I learn about art?* The reader's interest may be even more specific. In the field of the Earth sciences, the question might be: *What can I learn about the Earth's constituent minerals and rocks?* or *What can I learn about weather and climate?* In the field of art, the question might be: *What can I learn about the theory and classification of the arts?* or *What can I learn about music?*

Another point should be mentioned because, in the view of the Editors, it distinguishes the Fifteenth Edition from all preceding editions.

The Outline of Knowledge presented in this Propædia volume was constructed *before* those articles themselves were named, outlined, commissioned, written, and edited. The outline served as the basis for determining what articles should be written, what their scope should be, how they should be related to other articles, and so on. It was, therefore, in origin a table of *intents* rather than a table of *contents*. It represented the intentions of the Editors in laying down a

comprehensive plan for producing a new encyclopædia, appropriate to the state of human knowledge and learning at the end of the 20th century and looking forward to emergent developments in the century to follow. What was originally, or in the planning stage of the work, a Table of Intents, then subsequently became, after the writing and editing of the articles was completed, a Table of Contents that tries to reflect accurately and faithfully the actual content of the articles.

All preceding editions of *Britannica*, as most other encyclopædias, have been constructed from classified lists of articles. Such classified lists may vary from one edition to another, as they have from the First Edition of *Britannica* through the Fourteenth, but the variations are relatively minor as compared with the fact that they are all the same in form—nothing but classified lists of articles, as exemplified by the one presented in the Eleventh Edition, already referred to. In sharp contrast to such editorial procedures, the Fifteenth Edition has the distinction of being planned not in accordance with a classified list of articles, but rather in the light of an orderly topical outline of the whole of human knowledge, in the form of the circle of learning that is an *en-cyclo-paedia*.

MORTIMER J. ADLER
Director of Planning

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Introduction to Part One:

The Universe of the Physicist, the Chemist, and the Astronomer

by Nigel Calder

“Give me matter and I will build a world from it.” For 200 years since the philosopher Immanuel Kant uttered it, physicists, chemists, and astronomers have striven to make good that boast. That they can now tell an almost unbroken story of events from the birth of the universe to the origin of life on Earth is the cumulative result of many lifetimes spent in careful observation and experiment. Yet even amid this success in updating the first verses of Genesis, new questions nag. Why does familiar matter adopt the forms it does? Are the laws of nature that are known to us enforced throughout the vast, tumultuous universe? What unimaginable worlds of fire or blackness can nature conjure up, quite different from our own?

When men presume to take the fire of the Sun and put it experimentally in a bottle, they forfeit all hope of certainty and repose. Yet the great quest for control over nature starts gently enough. A child at play with building blocks or sand or a rubber ball is a human mind engaged in discovering how matter behaves. Experiments with the rubber ball, for example, reveal laws of reflection. The child finds that the ball will come back to him only if he projects it accurately at a right angle to a flat surface (wall or floor); otherwise it bounces away from him and another child may grab it and interrupt the research program.

If all grown-up children had abandoned this kind of play, the human species would still believe that the Earth was at the centre of the universe, that the planets were propelled by angel-power, and that thunder was the voice of God. But some adults retained the boundless inquisitiveness of the young. Isaac Newton, not the most modest of discoverers, likened himself to a child playing on the seashore. Critics nowadays refer scathingly to the “expensive toys” of the physicists who want many millions of dollars to build a particle accelerator. Not unfairly—a particle accelerator, for all its awesome complexity and cost, is simply a modern way of continuing the experiments with the rubber ball, to see what happens when the ball is very small and travels almost at the speed of light.

By strange paths, play leads to far-reaching results. After the discovery that an electric current creates magnetism, Michael Faraday made a note to look for electricity from magnetism. He played repeatedly with magnets and wires until, ten years later, he discovered electromagnetic induction. Today, giant turbogenerators confirm his discovery 60 times a second, as they feed electric power to our factories and kitchens. In James Clerk Maxwell’s hands, Faraday’s ever-changing electric currents transformed themselves into mathematical equations predicting the existence of waves that traveled at the speed of light—indeed *were* light and invisible radiations of a similar kind, including radio waves. Other researchers who were unwittingly taking atoms to pieces came up with a beam of electrons, which inventors turned into a magic pencil;

today those waves and electrons enable lesser men to preen themselves on television screens in 260,000,000 homes.

In this latter part of the 20th century, a word-association test for *physicist* may very well evoke *bomb*. By coincidence, investigators of the nature of matter and energy stumbled upon a way of breaking open the storehouse of energy in the nucleus of the atom just at the time the human species was entering a period of unprecedented warfare. The swarms of nuclear-powered submarines that cruise with nuclear-tipped, city-killing missiles are a grim enough outcome of the “game.” The fact remains that the heart of physics itself is not directed to any such purpose but is an open, cooperative effort by scientists of all nations to understand the material universe we live in.

We inhabit an electric world. It is true that gravity stops us from falling headfirst into the abyss of space; true also that the daylight that powers all life comes from the nuclear reactor that we call the Sun. But of the great set of natural forces known to the physicist—gravitational, nuclear, and electromagnetic—the last, electromagnetism, is the chief governor of events on Earth.

It operates so discreetly, though, that when men started rubbing amber on their sleeves and found it attracted dust, or considered the seeming magic of the north-pointing lodestone, nothing suggested that these were more than curiosities. There was laughter when Benjamin Franklin said that lightning was electric—until he proved it. Nothing suggested that the colour, quality, and chemical behaviour of all familiar matter would be explained by research in electricity and magnetism. But that is in the nature of physics: you ponder the falling of an apple and realize what holds the planets in their courses; you look to see what happens when you pass electric currents through a gas and, in due course, you find out what holds a stone together and why grass is green.

A series of discoveries in the late 19th and early 20th centuries illuminated the hidden mechanisms of our electric world like star shells on a dark night. Diligent work by chemists had shown that all matter was composed of vast numbers of atoms, different for each chemical element and capable of combining in predictable ways to make molecules and crystals. Indeed there was a remarkable pattern in the so-called “periodic table”: when the chemical elements were listed by weight, it turned out that elements 3, 11, and 19 . . . all had similar properties; 4, 12, and 20 . . . were also very much alike, and so on.

This pattern made sense only when the physicists discovered the construction of atomic matter. An atom consists of a heavy nucleus surrounded by a number of lightweight electrons exactly neutralizing the electric charge on the nucleus. The electrons group themselves around the nucleus in “shells,” like the layers of an onion, each shell being capable of accommodating a definite number

of electrons. The outward face of the atom, its outermost shell of electrons, is crucial in determining its chemical behaviour. The number of electrons to be fitted in depends on the charge on the nucleus. In some elements, the metals, there are only one or two easily detachable electrons in the outermost shell. Other elements, the most reactive nonmetals, fall short by only one or two electrons in having a complete outermost shell. These "surplus" and "missing" electrons create a supply-and-demand situation in which atoms combine chemically by exchanging or sharing electrons. The repetition of chemical properties throughout the periodic table arises as one shell of electrons is completed and the next one begins to fill.

The mechanisms sketched in these last few sentences account for almost all the chemical behaviour of all the matter on Earth. The electrical and magnetic behaviour of materials also depends on the arrangements of electrons in their atoms and, in some cases, on the combined effects of many atoms packed together in a crystal. The strength of the chemical bonds formed by electrons, and the related forces between molecules, determine whether materials are solids, liquids, or gases; and they help to fix the strength and flexibility of solids, but in this case the explanations are complicated by the invisible flaws that exist in all materials. The colour of materials is explicable by the "jumps," from one position to another in the vicinity of an atom, which the rules allow an electron to make as the atom, molecule, or crystal absorbs or emits light of particular energy, or colour. Make the same electrons in vast numbers of atoms "jump" the same way simultaneously and you have a very intense laser beam.

Light and its invisible counterparts—radio waves, infrared, ultraviolet, and X-rays—are the purest form of energy. These "electromagnetic radiations" are created by the jerking of electrons, sometimes quite gently, as in a radio antenna, and sometimes very fiercely, as when a beam of fast-moving electrons is suddenly halted by the target in an X-ray tube. The normal "jumps" of electrons in atoms are of intermediate intensity. All these radiant forms of energy can travel through empty space, for example from the Sun to the Earth.

But energy can readily change from one form to another. Sunlight captured by green leaves is converted into the chemical energy of plant-stuff. Coal is plant-stuff buried millions of years ago when continents collided, and a boiler can convert the chemical energy of coal into a scalding jet of steam that turns the blades of a turbine—these are forms of kinetic energy, the energy of directed movement. Using Faraday's trick, the turbine can generate electrical energy. At the end of this chain of transformations, you can switch on the electrical energy and reconvert it to light energy, thereby enjoying the benefits of sunlight after the Sun has set.

The vibrations of sound and the gravitational energy of water about to cascade down a mountainside are other forms of energy. Sooner or later, though, a shout dies away, water comes to rest, the light from your electric bulb is absorbed in the wallpaper. Where has the energy gone? It has been taken up in those random motions of atoms and molecules that we call heat. All energy degrades to meaningless heat eventually.

Unless there were continuous supplies of new energy,

life and indeed all interesting activity in the universe would quickly cease. For example, your brain is kept functioning by food—chemical energy produced by sunlight just in the past few months. Those new supplies of energy come from the transformation of matter into energy.

The Sun is a very ordinary star, lying in the suburbs of a galaxy consisting of about 100,000,000,000 stars; we see the rather flat cross section of the galaxy as the Milky Way, a brushstroke of light across the night sky. There is nothing special, even, about our Galaxy; it is just one of vast numbers of galaxies scattered like ships in a great ocean of space.

The universe is a battleground between gravity and nuclear forces. To make a star, gravity sweeps together a mass of hydrogen gas; it becomes hot and nuclear reactions begin. The nuclei of hydrogen atoms combine together to make heavier elements almost, but not quite, as heavy as the sum of the hydrogen nuclei that went into them. The little bit of matter that is lost is converted into a relatively immense amount of energy. It would blow the star apart but for the strenuous restraint of gravity. A balance is struck, and the size and brightness of a star depends on its mass and on how much of its nuclear fuel has been burned. Fortunately, our star, the Sun, is a slow-burner; nevertheless, inexorable physical changes billions of years from now will make the Sun grow to fill the whole of our sky and swallow the Earth.

In a star more massive than the Sun, this "burning" of nuclear fuel proceeds faster and culminates in a vast explosion called a supernova. In the explosion, nuclear reactions proceed apace and make all the different chemical elements. The diverse atoms, heavier than hydrogen, of which our own bodies are constructed, were made in stars that exploded before the Sun was formed. Some of the heavy material was left swirling around the newborn Sun and made the Earth. Radioactive energy stored in some of the elements provided an internal source of heat for the Earth that accounts for volcanoes, earthquakes, and the slow movements of continents. Sunlight stirred the materials on the surface of the Earth into chemical activity. Eventually this activity became organized in peculiar ways, and life began.

So far, so good. But there are new mysteries that are "out of this world," in the sense that matter and energy are involved in events far more violent than anything normally encountered on the Earth or even in the Sun. The paramount questions with which physicists are now wrestling can be paraphrased as follows: Why is hydrogen the raw material of the universe? Experiments with the nucleus of the hydrogen atom—the proton—are undertaken in the big accelerators that transform the stuff of the atomic nucleus into bizarre, short-lived particles. These particles have properties, similar to electric charge, called the hypercharge and the baryon number. For example, the proton itself has, besides an electric charge of +1, a hypercharge of +1 and a baryon number of 1. However the particles may transform themselves in violent interactions, the totals of charge, hypercharge, and baryon number do not change.

Attempting to find out why this partial order remains amid the confused varieties of nuclear matter, theorists are led to the idea that the particles we see consist of

combinations of other, quite different particles that they have named quarks. An early success of this theory was the prediction of the existence of a new combination, a particle called the omega minus that eventually turned up in 1964 during an experiment with the big machine at the Brookhaven National Laboratory, Long Island, N.Y. The quarks themselves have not been discovered at the time of writing.

The next big leap in understanding may well come when the theory of how small pieces of matter behave is blended with the theory of gravity, which at present concerns the huge pieces of matter that make up our universe of galaxies, stars, and planets. With such a "unified" theory physicists may at last be able to answer that question about the raw material of the universe—why hydrogen? At the same time, we shall perhaps come to understand why matter was formed in the "big bang," with which (as many astronomers now suppose) the universe came into existence some 10,000,000,000 years ago, or why the "big bang" was not merely a "big flash."

Even so fundamental an advance would not exhaust the opportunity for fresh discovery in the physical sciences. Another set of pregnant problems results from very strange objects recently discovered in the sky, namely "hot" galaxies, quasars and pulsars. The quasars, in particular, are compact objects of such extraordinary energy that existing laws of physics seem scarcely able to account for them. The pulsars, which flash many times a minute, are also very odd, but less baffling. They are evidently remnants of exploded stars that have collapsed to the enormous density

of the material of the atomic nucleus. If an ocean liner were compressed to the density of a pulsar, it would be no bigger than a grain of sand.

The evidence of the pulsars encourages a further idea—one of the strangest in the whole history of man's study of matter and energy. In a pulsar, nuclear forces prevent collapse to even greater densities. But if the collapsed star were even more massive, gravity would be stronger and it would overwhelm even the nuclear forces. Then there would be nothing to stop the process until the whole star had collapsed to smaller than a peanut. Through the intense gravitational field thus set up, no light could escape, and the star would in effect disappear from the universe. Only its gravity would remain, like the grin of the Cheshire Cat in *Alice in Wonderland*, and, if a space traveler ran into one of these "black holes," he too would be drawn to the same invisible kernel, there to disappear forever—or at least until the laws of physics change.

The possibility that such black holes exist holds out a hope of explaining the quasars as objects of this kind from which material somehow "bounces" out. But that is only a little comfort when scientists have now to reexamine the theory of gravity, which they thought Einstein had cleared up 60 years ago, and to work out the implications of a universe peppered with black holes where the familiar laws of nature are unlikely to apply. There is even the uncomfortable suggestion that our whole universe may be just a big black hole in someone else's universe! Physics, the master science, cannot evade these new battles of the mind.

Part One. Matter and Energy

Three points should be noted about the scope of Part One and its relations to other parts.

The sciences of physics, chemistry, and astronomy have themselves been the object of historical and analytical studies regarding their nature, scope, methods, and interrelations. Part Ten, on the branches of knowledge, is concerned with such studies. The outline in Section 10/32 of Part Ten deals with the sciences of physics, chemistry, and astronomy and treats their history, their nature and scope, and their principal problems and interrelations.

The design and operation of observational and experimental instruments are important in the development of the physical sciences. The treatment of scientific instrumentation is placed in Section 723 of Part Seven, on technology.

Accounts of the several kinds of mathematics used in observation and experiments, and in the derivation and application of physical theories, are set forth in Division II of Part Ten.

The three increasingly complementary physical sciences of physics, chemistry, and astronomy house the knowledge and the organizing theories about matter in all its dimensions, from subatomic particles to the cosmos, about all the states of matter, all the forms of energy, and all the interrelations of matter and energy.

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II. Energy, Radiation, and the States and Transformation of Matter 27

III. The Universe: Galaxies, Stars, the Solar System 51

Division I. Atoms: Atomic Nuclei and Elementary Particles

The outlines in the two sections of Division I deal with subatomic and atomic physics.

Section 111. The Structure and Properties of Atoms 21

112. The Atomic Nucleus and Elementary Particles 23

Section 111. The Structure and Properties of Atoms

A. The atomic nature of matter

1. The atom as consisting of the nucleus surrounded by electrons, the arrangement and behaviour of which determine atomic interactions
2. Early philosophical speculations on the possible atomic nature of matter
3. The scientific evidence for the existence and the nature of atoms
 - a. Developments in chemistry
 - b. The development of spectroscopy and the discovery of atomic spectra
 - c. The discovery of the electron as a particle and as a component of all matter
 - d. The discovery of X rays
 - e. The discovery of the radioactive transformation of one element into another
 - f. The Brownian movement of suspended particles
 - g. The development of mass spectrometry
 - h. The development of scattering and resonance studies with atomic and molecular beams
4. Models of atomic structure
 - a. The Rutherford model of the atom
 - b. The Bohr–Sommerfeld model
 - c. The wave-mechanical theory of the electronic structure of the atom

B. Atomic weights

1. Variations in atomic weight as a result of variations in isotopic composition
2. Significance of atomic weights in chemistry
3. Atomic weight scales
4. Methods used for determining atomic weights: chemical methods, physical methods

C. Atomic spectra and the electronic structures of the atom

1. Atomic spectra: their significance and interpretation
 - a. The spectrum of the hydrogen atom
 - b. The emission spectra of singly and multiply ionized atoms
 - c. Atomic absorption spectra
 - d. The effects of magnetic fields and the effects of electric fields on atomic spectra
 - e. Intensities, isotope shifts, and fine and hyperfine structures of atomic spectral lines as related to atomic structure
2. Theories of the origin of atomic spectra in quantized electronic transitions: the classical Bohr theory, wave-mechanical interpretations

D. X rays and atomic structure

1. General X-ray phenomena
2. The theory of X rays and their spectra
 - a. The structure of the atom as related to the emission of characteristic X rays, absorption edges, fluorescence yield, mesic atoms
 - b. Continuous X rays and bremsstrahlung; *i.e.*, the radiation produced by the sudden retardation of a fast-moving charged particle in an intense electrical field
3. Detection and measurement of X rays
4. Applications of X rays in biological, medical, industrial, and scientific fields
[see 423.B. and 723.G.8.]
5. Diffraction of X rays by crystals
[see 125.A.2.]

E. The concept of antimatter

1. General properties of antimatter
2. Production of antiparticles in high-energy collisions
3. Invariance of the laws of physics under charge conjugation, an operation in relativistic mechanics that transforms every particle into its antiparticle
4. Speculations about the possible existence and role of antimatter in the universe

F. The fundamental physical constants: dimensional and dimensionless constants

1. Measurement of the physical constants
2. Interrelationships among the constants
3. Standards of measurement

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the structure and properties of atoms

Analysis and Measurement, Physical and Chemical
 Atoms: Their Structure, Properties, and Component Particles
 Physical Science, Principles of
 Physical Sciences, The

MICROPAEDIA: Selected entries of reference information

General subjects

<i>atom models:</i>	Franck-Hertz	<i>laws and principles:</i>	<i>other:</i>
Aufbau principle	experiment	complementarity	antimatter
Bohr atomic model	Fraunhofer lines	principle	atom
electronic	ionization	Pauli exclusion	atomic mass
configuration	potential	principle	atomic radius
octet	magnetic	quantum	energy state
Rutherford atomic	resonance	mechanics	excitation
model	spectral line series	Schrödinger	matter
shell atomic model	Stark effect	equation	orbital
<i>experimental effects</i>	Stern-Gerlach	selection rule	positronium
<i>results:</i>	experiment	uncertainty	quantum
Auger effect	Zeeman effect	principle	quantum number
Brownian motion	<i>fundamental</i>	wave-particle	transition
electron	<i>constants:</i>	duality	X ray
paramagnetic	molar gas constant		zero-point energy
resonance	Planck's constant		

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 - a. Mass
 - b. Charge: atomic number
 - c. Radius
 - d. Spin
 - e. Magnetic moment: nuclear magnetic resonance phenomena
 - f. Electric quadrupole moment
2. Components of atomic nuclei
 - a. Neutrons
[see D., below]
 - b. Protons
 - c. Other possible short- and long-lived components
3. Isotopes: atomic species with the same atomic number but with different atomic masses
[see B., below]
4. Systematic relationships between nuclear masses and nuclear binding energies
5. Nuclear models and the properties of nuclear states
6. Theories of nuclear structure and nuclear binding force
7. General nuclear phenomena and reactions
[see C. and E., below]
8. The formation and evolution of the atomic nuclei in the universe

B. Isotopes: atomic species with the same atomic number but with different atomic masses

1. Classification of isotopes or nuclides
2. Isotopic composition of the elements
3. Formation of isotopes by nuclear reactions
[see E., below]

4. Effects of isotopic substitution on physical and chemical properties of substances
 5. Chemical and physical separation of isotopes
 - a. Mass spectrometry
 - b. Other methods of separation; *e.g.*, diffusion, centrifugal separation, thermal diffusion
 6. Applications of radioactive and stable isotopes
[see 242.D.2. and 723.G.8.]
- C. Radioactive nuclei: their properties and their radiations
1. The phenomenon of radioactivity
 2. Types of radioactivity
 3. Sources of radioactivity: naturally occurring radioactive elements, particle bombardment
 4. Interaction of radiation with matter
[see I., below]
 5. The energy release associated with radioactive decay
 6. Nuclear models used to explain nuclear binding: the liquid drop model, the shell model, the unified model
 7. Rates of radioactive transitions
 - a. Exponential decay law
 - b. Alpha decay
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 8. Applications of radioactivity
[see 723.G.8.]
 9. Measurement and characterization of radioactivity
[see I.4., below]
- D. The neutron as a component of the nucleus and in nuclear reactions
1. Properties of neutrons
 2. Sources of neutrons
 3. Manipulation and control of neutrons
 4. Nuclear reactions produced by neutrons
 5. Neutron detection based on the secondary effects of nuclear reactions
- E. Reactions of atomic nuclei
1. The classification of nuclear reactions
 - a. The types of nuclear reactions classified according to the kind of bombarding radiation or particles
 - b. The types of nuclear reactions classified according to the nuclear processes involved or according to their products
 2. The energy relationships of nuclear reactions
 3. Theories and models of nuclear reactions
- F. The splitting of atomic nuclei by nuclear fission
1. Phenomena of nuclear fission
 - a. Spontaneous and induced fission reactions
 - b. Products of nuclear fission
 - c. The energy released in fission
 2. Fission chain reactions: the critical mass
 - a. Nuclear explosions: nuclear, or atomic, bombs
 - b. Controlled nuclear fission
 3. Nuclear models and theories of nuclear fission: liquid drop model, adiabatic models, statistical models

G. The fusion of atomic nuclei

1. Phenomena of nuclear fusion
2. Nuclear fusion reactions
 - a. General types of fusion reactions
 - b. The energy released in fusion reactions
 - c. Requirements for intensive fusion reactions
3. Occurrence of thermonuclear reactions
 - a. Thermonuclear reactions in the Sun and the stars
 - b. Thermonuclear explosions: the hydrogen, or thermonuclear, bomb
4. Basic conditions required for a thermonuclear reactor
 - a. The formation of a suitable plasma
 - b. The confinement and control of high-temperature plasma
5. The possible approaches to controlled fusion: prospects for the future

H. Subatomic, or elementary, particles

1. Development of the concept of subatomic particles as the fundamental units of matter and energy
 - a. The discovery of the various particles
 - b. Yukawa mesons and the theory of nuclear forces
 - c. Advances in quantum field theory: renormalization theory, dispersion theory
 - d. The known elementary particles
 2. The fundamental forces associated with particle interactions
 3. Systems for classifying the elementary particles
 - a. According to the forces that influence them
 - b. According to the kind of statistics they follow
 - c. According to their particle-antiparticle symmetries
 - d. According to stability
 - e. According to charge multiplets
 - f. According to unitary symmetry, or the SU(3) classification
 - g. According to charged-hypercharge multiplets
 4. Elementary particles and the laws of conservation and symmetry
 - a. The theory of subatomic particles and the quantum mechanical symmetry operations
 - b. Dynamic symmetries: space and time inversion
 - c. Violation of conservation laws: charge conjugation, time reversal, parity
 - d. Internal symmetries
 5. Sources of the unstable elementary particles
 - a. Formation of resonances in high-energy accelerators
 - b. Production by cosmic ray interactions
 6. Relations of the weak interactions to strong and electromagnetic interactions described by conserved current and algebra of current
 7. Other particles suggested by contemporary theoretical ideas
 8. Reactions of elementary particles with atoms
 9. Theories of nuclear structure and nuclear forces involving the elementary particles
- I. Effects of the passage of nuclear, or elementary, particles, nuclear radiations, or ionizing radiation through matter
1. The fundamental processes involved when energetic particles or radiations interact with or pass through matter
 - a. The passage of electromagnetic waves and their interaction with atomic structure

- b. The passage of particles or radiations through matter
2. Secondary and tertiary effects of radiation: physical effects, molecular activation and related phenomena, chemical effects, biological effects
3. Utilization of high-energy radiation in biological, medical, and technological fields
4. The use of fundamental processes of interaction between radiation and matter for the detection and characterization of nuclear and elementary processes
 - a. Mechanisms of detection systems: ionization and charge collection, conversion of the distributed energy of the primary ionizing particle into light
 - b. Properties of ionization media
 - c. Major types of radiation detectors: scintillation counters, ionization detectors, spark chambers, cloud chambers, bubble chambers
[see 723.F.7.]
 - d. Applications of radiation detectors in science, technology, and industry
[see 723.G.8.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the atomic nucleus and elementary particles

Analysis and Measurement, Physical and Chemical	Radiation
Atoms: Their Structure, Properties, and Component Particles	Subatomic
Physical Sciences, The	Particles

MICROPAEDIA: Selected entries of reference information

General subjects

<i>conservation laws and symmetry:</i>	liquid-drop model	radioactive isotope	Cherenkov
charge conjugation	magic number	radioactive series	radiation
charge	magnetic	radioactivity	Compton effect
conservation	resonance	<i>subatomic particles:</i>	de Broglie wave
CP violation	nuclear magnetic	alpha particle	electron diffraction
Eightfold Way	resonance	antiparticle	electron optics
energy,	nuclear model	antiproton	electroweak theory
conservation of	nuclide	baryon	Fermi-Dirac
gauge theory	shell nuclear	boson	statistics
isospin	model	electron	flavour
momentum,	<i>particle interactions:</i>	hadron	gluon
conservation of	cross section	Higgs particle	Millikan oil-drop
parity	fundamental	hyperon	experiment
spin	interaction	J/psi particle	neutron optics
time reversal	pair production	lepton	quantum
<i>nuclear interactions:</i>	proton-proton	magnetic	chromodynamics
excitation	cycle	monopole	quantum
fission product	scattering	meson	electrodynamics
neutron capture	<i>radiation detection:</i>	muon	radiation
nuclear energy	cloud chamber	neutrino	renormalization
nuclear fission	coincidence	neutron	standard model
nuclear fusion	counting	photon	Stern-Gerlach
nuclear reaction	ionization chamber	positron	experiment
nucleosynthesis	solid-state detector	proton	strong nuclear
spallation	spark chamber	quark	force
spontaneous fission	<i>radioactivity:</i>	quasiparticle	synchrotron
thermonuclear	activity	subatomic particle	radiation
reaction	alpha decay	tau	unified field
transmutation	beta decay	thermal neutron	theory
<i>nuclear structure:</i>	decay constant	W particle	wave function
binding energy	fallout	Z particle	weak nuclear
collective model	gamma decay	<i>other:</i>	force
compound-nucleus	gamma ray	Bose-Einstein	
model	half-life	statistics	
isotope	isomer	bremsstrahlung	
	metastable state		

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Division II. Energy, Radiation, and the States and Transformation of Matter

[For Part One headnote see page 21.]

Division I deals with modern advances in subatomic and atomic physics.

The outlines in the first three sections of Division II treat, respectively, chemical elements, chemical compounds, and chemical reactions. The last five sections of this division are concerned with heat, thermodynamics, and the nonsolid states of matter; with the solid state of matter; with the mechanics of particles, rigid bodies, and deformable bodies; with electricity and magnetism; and with waves and wave motion.

- Section 121. Chemical Elements: Periodic Variation in Their Properties 27
 122. Chemical Compounds: Molecular Structure and Chemical Bonding 29
 123. Chemical Reactions 34
 124. Heat, Thermodynamics, and the Nonsolid States of Matter 37
 125. The Solid State of Matter 40
 126. Mechanics of Particles, Rigid Bodies, and Deformable Bodies: Elasticity, Vibrations, and Flow 43
 127. Electricity and Magnetism 45
 128. Waves and Wave Motion 48

Section 121. Chemical Elements: Periodic Variation in Their Properties

- A. The systematic classification of the elements on the basis of their chemical and physical properties and atomic structures: the periodic law of the elements
- B. The groups of the chemical elements in the long form of the periodic table: their occurrence, history, physical and chemical properties, principal compounds, production, and uses
 1. Hydrogen, its forms, isotopes, and compounds: water, its structure, forms, and physical and chemical properties
 2. The alkali metals, or the Group Ia elements of the periodic table: lithium, sodium, potassium, rubidium, cesium, francium
 3. The alkaline-earth metals, or the Group IIa elements of the periodic table: beryllium, magnesium, calcium, strontium, barium, radium
 4. The boron group of the elements, or the Group IIIa elements of the periodic table: boron, aluminum, gallium, indium, thallium
 5. The carbon group of the elements, or the Group IVa elements of the periodic table: carbon, silicon, germanium, tin, lead
 6. The nitrogen group of the elements, or the Group Va elements of the periodic table: nitrogen, phosphorus, arsenic, antimony, bismuth
 7. The oxygen group of the elements, or the Group VIa elements of the periodic table: oxygen, sulfur, selenium, tellurium, polonium
 8. The halogen elements, or the Group VIIa elements of the periodic table: fluorine, chlorine, bromine, iodine, astatine
 9. The noble gases, or the Group 0 elements of the periodic table, formerly called the inert gases: helium, neon, argon, krypton, xenon, radon
 10. The zinc group elements, or the Group IIb elements of the periodic table: zinc, cadmium, mercury
 11. The transition elements: elements with partly filled *d* or *f* orbitals occupying the middle portion of the periodic table
 - a. Individual elements of the first transition series: titanium, vanadium, chromium, manganese, iron, cobalt, nickel, copper
 - b. Individual elements of the second and third transition series: zirconium and hafnium, niobium and tantalum, molybdenum and tungsten, technetium and rhenium, ruthenium and osmium, rhodium and iridium, palladium and platinum, silver and gold

- c. The lanthanide elements
[see B.12., below]
 - d. The actinide elements
[see B.13., below]
 - 12. The rare-earth, or lanthanide, elements of the periodic table: scandium, yttrium, lanthanum, cerium, praseodymium, neodymium, promethium, samarium, europium, gadolinium, terbium, dysprosium, holmium, erbium, thulium, ytterbium, lutetium
[see also 724.C.3.u.]
 - 13. The actinide elements of the periodic table: actinium, thorium, protactinium, uranium, neptunium, plutonium, americium, curium, berkelium, californium, einsteinium, fermium, mendelevium, nobelium, lawrencium
 - 14. The transactinide elements of the periodic table: unnilquadium (or rutherfordium), unnilpentium (or hahnium), unnilhexium, unnilseptium, unniloctium, unnilennium; heavier elements which have yet to be discovered but whose existence is extrapolated based on the periodic law
- C. Other classifications of the elements or groups of them
- 1. Metals; semimetals, or metalloids; nonmetals
 - 2. Stable and radioactive elements
 - 3. Native and combined elements
 - 4. Noble metals, including the platinum group of metals
 - 5. Synthetic elements: transuranium elements
 - 6. Biologically active or essential elements
[see 335.A.3.]
 - 7. Technologically significant elements
[see 724.C.3.]
- D. The origin of the elements and their relative abundances in nature
- 1. On Earth
 - a. In the crust
[see also 214.C.]
 - b. In the hydrosphere
[see also 222.B. and C.]
 - c. In the atmosphere
[see also 221.A.1.]
 - d. In the biosphere
 - 2. In the solar system
[see also 133.A.]
 - 3. In the stars
[see also 132.D.7.b.]
 - 4. In the rest of the universe
[see also 131.A.1.a.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with chemical elements: periodic variation in their properties

Chemical Compounds

Chemical Elements

MICROPAEDIA: Selected entries of reference information

General subjects

<i>actinide elements:</i>	fermium	thorium	rubidium
actinide	lawrencium	uranium	sodium
actinium	mendelevium	<i>alkali metals:</i>	<i>alkaline-earth metals:</i>
americium	neptunium	alkali metal	alkaline-earth
berkelium	nobelium	cesium	metal
californium	plutonium	francium	barium
cerium	protactinium	lithium	beryllium
einsteinium		potassium	calcium

magnesium	nitrogen group	ytterbium	nickel
radium	element	yttrium	niobium
strontium	phosphorus	<i>synthetic elements,</i>	osmium
<i>boron group:</i>	<i>noble gases:</i>	<i>including the</i>	palladium
aluminum	argon	<i>transuranium</i>	platinum
boron	helium	<i>elements:</i>	rhenium
boron group	krypton	americium	rhodium
element	neon	berkelium	ruthenium
gallium	noble gas	californium	silver
indium	radon	curium	tantalum
thallium	xenon	einsteinium	technetium
<i>carbon group:</i>	<i>oxygen group:</i>	fermium	titanium
carbon	oxygen	lawrencium	transition element
carbon group	oxygen group	mendelevium	tungsten
element	element	neptunium	vanadium
germanium	polonium	nobelium	zirconium
lead	selenium	plutonium	<i>zinc group:</i>
silicon	sulfur	promethium	cadmium
tin	tellurium	technetium	mercury
<i>halogen elements:</i>	<i>rare-earth elements:</i>	transuranium	zinc
astatine	cerium	element	zinc group
bromine	dysprosium	unnilennium	element
chlorine	erbium	unnilhexium	<i>other:</i>
fluorine	europium	unniloctium	allotropy
halogen	gadolinium	unnilpentium	Aufbau principle
iodine	holmium	unnilquadium	chemical element
<i>hydrogen and its</i>	lanthanum	unnilseptium	chemical symbol
<i>isotopes:</i>	lutetium	<i>transition elements:</i>	group
deuterium	neodymium	chromium	lanthanide
hydrogen	praseodymium	cobalt	contraction
tritium	promethium	copper	metal
<i>nitrogen group:</i>	rare-earth metal	gold	metalloid
antimony	samarium	hafnium	nonmetal
arsenic	scandium	iridium	nucleosynthesis
bismuth	terbium	iron	periodic law
nitrogen	thulium	manganese	
		molybdenum	

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INDEX: See entries under all of the terms above

Section 122. Chemical Compounds: Molecular Structure and Chemical Bonding

- A. The theory of molecular structure: its history and development
 1. Early concepts of molecular structure
 2. Quantum mechanical and electrostatic approaches to the theory of molecular structure
 3. Molecular bonds and shapes
 - a. Spatial arrangement of atoms: chains, rings, chelates, polymers
 - b. Isomers: structural isomers, stereoisomers
 4. Time-dependency properties of molecules
 5. Molecular structure and its relation to the properties of bulk matter
 - a. The physical properties of matter as affected by molecular size, shape, and interactions, and interactions of molecules with radiations and fields
 - b. The chemical behaviour of matter as determined by the nature of molecular bonds
 - c. The chemical, physical, and biochemical properties of a substance inferred from its known or postulated molecular structure

B. Experimental and theoretical procedures for the determination of molecular structures

1. The separation, isolation, and purification of chemical substances based on chemical equilibria and rate phenomena
 - a. By volatility differences: distillation, sublimation, evaporation
 - b. By chromatography: liquid phase, gas phase, thin layer
 - c. By solubility differences: precipitation, crystallization, zone melting, solvent extraction
 - d. By ion-exchange reactions
 - e. By electrophoresis and electrolytic methods
 - f. By mechanical methods: filtration, sedimentation, sieving, flotation, centrifugation
2. Classical methods of qualitative and quantitative analysis
3. Instrumental methods used to identify functional groups, molecular sub-units, and structural features
 - a. Spectrochemical methods: microwave, infrared, ultraviolet, Raman spectroscopy, colorimetry, atomic absorption spectroscopy
 - b. Mass spectrometry
 - c. Magnetic resonance spectrometry
 - d. Thermometric methods: thermogravimetry, calorimetry, cryoscopy
 - e. Radiochemical methods: radiometric analysis, activation analysis, isotopic dilution
 - f. Electrochemical methods: potentiometry, polarography, electrodeposition, oscillometry
4. Diffraction methods for determining molecular structures: electron, X-ray, and neutron beam diffraction
5. Physical methods used to determine optical activity, magnetic susceptibility, calorific values, heat of combustion, activation energy, and reaction rates
6. The synthesis and characterization of derivatives, or specifically modified molecules
7. The determination of molecular weight based on thermodynamic theory, on transport phenomena, and on known spatial arrangements of atoms in the solid state
8. The principles of conformational analysis as related to molecular structure
9. The scattering of molecular beams and its usefulness in the study of molecular interactions

C. Spectra of molecules

1. The theory of molecular spectra
2. Types of molecular spectra: microwave, infrared, Raman, visible, and ultraviolet spectra
3. The interpretation of molecular band spectra in determining molecular structure

D. The theory of chemical bonding: its development and experimental bases

1. Nonquantum treatments of chemical bonding
 - a. Early ideas and concepts of chemical bonding: valence
 - b. The early electronic theory of bonding
 - i. The nature of ionic bonds: shell theory, ion pairs
 - ii. The nature of covalent and coordinate bonds: the octet
 - c. Application of the quantum theory to atomic structure
2. Quantum-mechanical treatment of chemical bonding
 - a. Atomic and molecular orbital concepts
 - b. Bonding in the hydrogen molecule
 - c. Bonding in simple polyatomic molecules
 - d. Quantum-mechanical calculations
3. Other bonding effects: hydrogen bonding; metallic bonds in metals, intermetallic compounds, and coordination compounds; bonds in crystals, in weak associations, and in electron-deficient compounds
4. Experimental observation of chemical bonding

5. Anomalous molecular structures, or molecular fragments with apparently anomalous valences: free radicals, carbenes, carbanions, carbonium ions
- E. Systems of classification of chemical compounds or substances
1. By their elemental composition or molecular structure: organic, inorganic, organometallic, and nonstoichiometric compounds
 2. By their bond type: ionic, covalent, and coordination compounds
 3. By their chemical reactivity: acids, bases, and salts; oxidizing and reducing agents
 4. By their physical state: gas, liquid, and solid
 5. By their origin: natural and synthetic
- F. Inorganic compounds
1. Nomenclature of binary, ternary, and coordination compounds
 2. Structural classification of inorganic compounds
 - a. Salts
 - b. Oxides, anhydrides, acids, and bases
 - c. Coordination compounds
 - d. Organometallic compounds
[see G.1.c., below]
 - e. Catenates
 - f. Inorganic polymers
 - g. Special nonmetallic derivatives
 3. Methods of preparation of inorganic compounds
 4. Reactions of inorganic compounds; *e.g.*, acid–base, substitution, isomerization, oxidation–reduction, addition
- G. Organic compounds
1. The major groups of organic compounds: their nomenclature, chemical and physical properties, synthesis, occurrence, reactions, and analysis
 - a. Hydrocarbons: aliphatic and aromatic
 - b. Organic halogen compounds: alkyl, alkenyl, and alkynyl halides; aryl halides
 - c. Organometallic compounds
 - d. Alcohols, phenols, and ethers
 - e. Carboxylic acids and their derivatives
 - f. Aldehydes, ketones, and their derivatives
 - g. Organic nitrogen compounds
 - h. Organic sulfur compounds
 - i. Organic phosphorus compounds
 - j. Organic silicon compounds
 - k. Heterocyclic compounds
 - l. Oils, fats, and waxes
 - m. Carbohydrates
 - n. Amino acids, proteins, and peptides
 - o. Isoprenoids and terpenes
 - p. Steroids and their derivatives
 - q. Nucleotides and nucleosides
 - r. Nucleic acids: DNA and RNA
 - s. Alkaloids
 - t. Dyestuffs and pigments
 - u. Organic polymers

2. Preparation and purification of organic compounds
3. Physical properties of organic compounds
4. Reactions of organic compounds: addition, substitution, displacement, hydrolysis, pyrolysis, condensation, polymerization, molecular rearrangement

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with chemical compounds: molecular structure and chemical bonding

Biochemical Components of Organisms
Chemical Compounds

MICROPAEDIA: Selected entries of reference information

General subjects

<i>alcohols and phenols:</i>	<i>amino acids, proteins, and peptides:</i>	gallic acid	<i>esters:</i>
alcohol	amino acid	lactic acid	ester
amyl alcohol	collagen	maleic acid	ethyl acetoacetate
butyl alcohol	glutamic acid	malonic acid	lactone
cetyl alcohol	glutamine	oxalic acid	<i>polyester ethers:</i>
chlorophenol	gluten	peroxy acid	ether
cresol	histidine	salicylic acid	ethylether
ethyl alcohol	histone	soap	polyether
fusel oil	hydroxyproline	stearic acid	<i>heterocyclic compounds:</i>
glycerol	insulin	succinic acid	coumarin
glycol	keratin	tartaric acid	furan
methanol	myoglobin	<i>coordination compounds:</i>	imidazole
naphthol	pepsin	chelate	indole
phenol	peptide	coordination compound	lactone
phytol	prolamin	coordination number	melamine
picric acid	protein	effective atomic number	purine
propyl alcohol	proteolytic enzyme	ligand	pyran
pyrogallol	renin	ligand field theory	pyrazine
resorcinol	scleroprotein	metal carbonyl	pyrazole
<i>aldehydes and ketones:</i>	serotonin	<i>dyes and pigments:</i>	pyridine
acetone	transaminase	alizarin	pyrimidine
aldehyde	<i>carbides:</i>	anthraquinone	pyrrole
benzaldehyde	carbide	anthraquinone dye	quinoline
ethyl acetoacetate	silicon carbide	auxochrome	thiazine
formaldehyde	tungsten carbide	azo dye	thiazole
ketone	<i>carbohydrates:</i>	carmine	thiophene
<i>alkaloids:</i>	carbohydrate	chlorophyll	<i>hydrocarbons:</i>
alkaloid	cellulose	chromophore	acetylene
atropine	disaccharide	cochineal	benzene
caffeine	glucose	dye	biphenyl
cocaine	glycoside	flavonoid	butadiene
codeine	monosaccharide	indigo	butane
curare	pectin	lake	butene
ephedrine	polysaccharide	melanin	ethane
heroin	starch	porphyrin	ethylene
ibogaine	sugar	Prussian blue	hydrocarbon
mescaline	<i>carboxylic acids:</i>	quercitron bark	methane
morphine	acetic acid	triphenylmethane dye	naphthalene
nicotine	benzoic acid	ultramarine	olefin
piperine	butyric acid		paraffin
quinidine	carboxylic acid		hydrocarbon
quinine	citric acid		propane
scopolamine	fatty acid		styrene
theophylline	formic acid		

- toluene
 xylene
inorganic acids and oxides:
 acid
 carbon dioxide
 carbon monoxide
 Dry Ice
 hydrogen chloride
 hydrogen cyanide
 hydrogen ion
 nitric acid
 nitric oxide
 nitrous acid
 nitrous oxide
 oxide
 phosphoric acid
 phosphorous acid
 rare-earth metal
 silica gel
 silicic acid
 sulfur oxide
 sulfuric acid
 water glass
inorganic nitrogen compounds:
 ammonia
 ammonium
 hydroxide
 azide
 hydrazine
 hydroxylamine
isoprenoids and terpenes:
 abietic acid
 camphor
 carotene
 isoprene
 limonene
 menthol
 pinene
 terpene
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 assaying
 chemical
 precipitation
 chromatography
 colorimetry
 countercurrent
 distribution
 differential thermal
 analysis
 electrophoresis
 gas
 chromatography
 gel
 chromatography
 gravimetric
 analysis
 iodine value
- nephelometry and
 turbidimetry
 paper
 chromatography
 polarimetry
 polarography
 qualitative
 chemical analysis
 quantitative
 chemical analysis
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 chromatography
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 tautomerism
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 adenine
 adenosine
 triphosphate
 cytosine
 DNA
 guanine
 nuclease
 nucleic acid
 nucleoside
 nucleotide
 RNA
 thymine
 uracil
oils, fats, and waxes:
 babassu palm
 castor oil
 Chinese wax
 cod-liver oil
 cohune oil
 copra
 cottonseed
 essential oil
 fat
 fish oil
 grease
 lard
 linseed
 lipid
 oil
 phospholipid
- pine oil
 sperm oil
 spermaceti
 tallow
 triglyceride
 wax
 whale oil
organic halogen compounds:
 acid halide
 aldrin
 benzene
 hexachloride
 carbon
 tetrachloride
 chloral hydrate
 chlordane
 chlorobenzene
 chloroform
 chlorotrifluoro-
 ethylene
 cyanogen halide
 DDT
 dichlorobenzene
 ethyl chloride
 ethylene bromide
 ethylene chloride
 Freon
 halocarbon
 halon
 iodoform
 methyl bromide
 methyl chloride
 methylene chloride
 phosgene
 polychlorinated
 biphenyl
 tear gas
 tetrachloroethane
 tetrachloroethylene
 tetrafluoroethylene
 toxaphene
 trichloroethane
 trichloroethylene
 vinyl chloride
 vinylidene chloride
organic nitrogen, sulfur, or phosphorus compounds:
 amide
 amine
 aniline
 azo compound
 benzidine
 biotin
 choline
 diazonium salt
 dimethoate
 ethanolamine
- isocyanide
 nitrile
 nitro compound
 nitrobenzene
 nitroglycerin
 nitroso compound
 oxime
 parathion
 PETN
 phorate
 picric acid
 polysulfide
 sulfide
 sulfonamide
 sulfonic acid
 sulfoxide
 thiol
 thiourea
 urea
 xanthate
organometallic compounds:
 carborane
 ferrocene
 Grignard reagent
 metal carbonyl
 tetraethyl lead
peroxy compounds:
 hydrogen peroxide
 peroxide
 peroxy acid
petroleum, gasoline, oil, and coal:
 gasoline
 kerosine
 microcrystalline
 wax
 napalm
 naphtha
 paraffin wax
 petrochemical
 petroleum
polymers and resins:
 balsam
 copal
 copolymer
 dammar
 dragon's blood
 elastomer
 frankincense
 gamboge
 initiator
 latex
 Lucite
 macromolecule
 mastic
 monomer
 neoprene
 polyacrylonitrile
 polychlorotri-
 fluoroethylene

polyester	silver nitrate	resonance,	chemical formula
polyether	soap	theory of	chemical indicator
polyolefin	<i>steroids and their</i>	valence	definite
polystyrene	<i>derivatives:</i>	van der Waals	proportions,
polysulfide	aldosterone	forces	law of
polysulfone	cholesterol	<i>water:</i>	excitation
polytetrafluoro-	corticoid	anomalous water	functional group
ethylene	cortisol	deliquescence	homologous series
polyurethane	cortisone	efflorescence	ion-exchange resin
polyvinyl alcohol	ergosterol	hard water	ketene
polyvinyl chloride	sapogenin	heavy water	lecithin
resin	saponin	hydrate	litmus
rubber	steroid	ice	molecular sieve
silicone	steroid hormone	steam	molecule
turpentine	testosterone	water	multiple
urea-formaldehyde	<i>theory of chemical</i>	<i>other:</i>	proportions,
resin	<i>bonding:</i>	alicyclic compound	law of
vinyl compound	chemical	alkali	nonstoichiometric
<i>salts:</i>	association	anhydride	compound
alum	chemical bonding	base	phenolphthalein
ammonium	covalent bond	carbanion	phosphine
chloride	electronegativity	carbene	quinone
ammonium nitrate	ion	carbon disulfide	radical
lithium carbonate	ion pair	carbonate	
Rochelle salt	ionic bond	carbonium ion	
saltpetre	metallic bond	carbonyl group	
silane	orbital	chemical	
		compound	

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Section 123. Chemical Reactions**A. General considerations of chemical reactions**

1. Basic concepts involved in the study of chemical reactions: transformation, conservation of mass and energy, law of simple multiple proportions in compounds
2. Growth of major theories concerning chemical reactions
3. Classification and nomenclature of the principal kinds of chemical reactions
 - a. According to the relationship involved between the starting materials and the final products
 - i. Decomposition reactions
 - ii. Polymerization reactions
 - iii. Chain reactions
 - iv. Substitution reactions
 - v. Addition and elimination reactions
 - vi. Oxidation-reduction reactions
[see F., below]
 - vii. Acid-base reactions
[see E., below]
 - b. According to the energy changes involved
[see B.1., below]
 - c. According to the reaction rates or chemical kinetics involved
[see also C., below]
 - d. According to the reaction mechanism involved
[see D.4., below]

B. Energy changes in chemical reactions

1. The classification of chemical reactions according to energy changes involved: exothermic and endothermic
2. The significance of activation energy in chemical reactions
3. Thermodynamic relations in chemical reactions: chemical equilibrium, free energy and entropy changes

C. Rates of chemical reactions

1. Factors that affect the rate or direction of chemical reactions
 - a. Solvents
 - b. Temperature
 - c. Pressure
 - d. Catalysts
 - e. Collisions
 - f. Light
 - g. Isotopic substitution
 - h. Molecular structure
2. Factors that affect the kinetic order of chemical reactions: concentration of reactants, mechanism of reaction, conditions of the reaction
3. Factors that affect the extent of chemical reactions: equilibrium constant
4. Complex reactions: reactions governed by more than one reaction rate
5. Experimental methods for studying chemical kinetics
 - a. Measurement of reaction rates
 - b. Determination of the order of reactions
 - c. Relaxation methods
6. Kinetic studies as a means of elucidating reaction mechanisms

D. Mechanisms of chemical reactions

1. Factors influencing the course of a reaction: reactants, transition state, solvent, catalysts, products, reaction conditions
2. Energy changes through single-stage and multi-stage processes
3. Factors that reveal the mechanisms of a reaction: chemical and stereochemical nature of the reactants, intermediates, and products; kinetics of the reaction
4. Classification of reaction mechanisms based on the nature of electron pairing in the transition state, on the nature of the attacking species, on the nature of catalysis, on the number of components of the transition state
5. Mechanisms of the principal types of reactions: nucleophilic and electrophilic substitution, addition and elimination reactions

E. Acid–base reactions and equilibria

1. General properties of acids and bases
2. Theoretical approaches to acid–base concepts
 - a. The definition of an acid as a substance that gives rise to hydrogen ions and of a base as a substance that gives rise to hydroxyl ions in aqueous solutions
 - b. The Brønsted–Lowry concept defining an acid as a proton donor and a base as a proton acceptor
 - c. The Lewis electronic theory defining an acid as an electron acceptor and a base as an electron donor
3. Acid–base reactions
 - a. Proton-transfer reactions
 - b. Lewis acid reactions
 - c. Acid–base catalysis

4. Quantitative aspects of acid–base equilibria
 - a. Equilibria in aqueous solutions
 - b. Equilibria in nonaqueous solvents
 - c. Equilibria involving Lewis acids
 - d. The effect of molecular structure on acid–base equilibria
 5. The experimental study of acid–base reactions and equilibria
- F. Oxidation–reduction reactions
1. Major classes of oxidation–reduction reactions: oxygen atom transfer, hydrogen atom transfer, electron transfer
 2. Definitions of oxidation and reduction based on the reaction's stoichiometry
 3. Theoretical aspects of oxidation–reduction processes
 - a. The concept of oxidation state
 - b. Half reactions and the determination of redox potentials
 - c. Oxidation–reduction equilibria and reaction rates
 - d. Mechanisms of redox reactions
 4. Electrochemical reactions: chemical changes associated with the passage of an electrical current
 - a. The electrochemical process: types of reactions
 - b. Complex electrochemical reactions
 - c. The Nernst and Butler–Volmer equations
 5. Oxidation–reduction reactions in biological systems
 6. Oxidation–reduction reactions in combustion and flames
- G. Photochemical reactions
1. The photochemical process
 2. Experimental methods used in the study of the photochemical process and photochemical reactions
 3. The application of photochemical processes
- H. Chemical reactions and chemical theory in the synthesis of chemical compounds
1. Factors that affect the choice of a specific synthetic path
 2. Factors that affect the choice of reaction conditions
 3. The separation and purification of reaction products
[see 122.B.1.]
 4. The identification, characterization, and analysis of reaction products
[see 122.B.2. through 9.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with chemical reactions

Chemical Reactions
Physical Sciences, The

MICROPAEDIA: Selected entries of reference information

General subjects

*acid–base reactions
and equilibria:*

acid–base reaction
Brønsted–Lowry
theory
buffer
hydrogen ion
hydroxide

Lewis theory
pH

catalysis of reactions:
acid–base catalysis
catalysis
catalyst
catalyst poison
Ziegler–Natta
catalyst

electrochemistry:

anodizing
electrical double
layer
electrochemical
reaction
electrochemistry
electrolysis
electrolytic cell

electromotive
series

Faraday's laws of
electrolysis

*kinetics and
mechanism:*

activation energy
Arrhenius equation
chain reaction

chemical equilibrium	<i>oxidation and reduction:</i>	<i>preparative procedures:</i>	<i>others:</i>
chemical intermediate	antioxidant	alkylation	chemical reaction
collision theory	combustion	asymmetric synthesis	equivalent weight
initiator	oxidation-reduction reaction	chemical synthesis	Hess's law of heat summation
inversion	spontaneous	condensation	heterogeneous reaction
isotopic fractionation	combustion	reaction	homogeneous reaction
Markovnikov rule	<i>photochemistry:</i>	hydrogenation	reaction, heat of
mass action, law of	actinometer	hydrolysis	
microscopic reversibility,	photochemical equivalence law	ion-exchange reaction	
principle of	photochemical reaction	isomerization	
reaction rate	photolysis	polymerization	
relaxation phenomenon	photosensitization	sulfation	
transition-state theory			

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See Section 10/32 of Part Ten

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Section 124. Heat, Thermodynamics, and the Nonsolid States of Matter

A. The principles of thermodynamics

1. The description of physical phenomena based on the concepts of system, state of a system, and changes of state
2. The first law of thermodynamics
3. The second law of thermodynamics
4. Stable equilibrium
 - a. Equations relating properties of systems that are in, or are passing through, stable equilibrium states
 - b. Temperature considered as the potential governing the flow of energy between systems
 - c. Heat
 - i. The definition of heat as a form of energy transferred from one body to another under the influence of a difference in temperature
 - ii. Theories of heat: the phlogiston theory, the caloric theory, the kinetic molecular theory
 - iii. Heat transfer in matter: heat conductivity in solids, convection in liquids and gases, heat transfer in boiling liquids, evaporation and condensation
 - iv. Technical applications of heat energy
[see 721.B.7. and 725.A.5.a.]
 - v. Heat and its relation to entropy, work, and change of energy
5. Thermodynamic relations in simple systems
 - a. The Carnot cycle
 - b. Maxwell's equations relating entropy to pressure, volume, and temperature for closed systems that assume only stable equilibrium states
 - c. Phase changes and equilibria
 - d. Simple one-component systems: processes at constant volume and at constant pressure; the equation of state, which relates pressure, volume, and temperature for stable equilibrium states
 - e. Simple multicomponent systems: the Maxwell relations, Dalton's law for mixture of gases, Raoult's law and Henry's law for ideal solutions

- f. Bulk flow
 - g. Equilibrium in chemical reactions
[see 123.B.3.]
- 6. The third law of thermodynamics
- 7. The effects of applied force fields on simple systems
- 8. Steady rate processes; *e.g.*, systems approaching stable equilibrium, flow of a substance through a barrier
- 9. Statistical thermodynamics
 - a. The laws of thermodynamics that consider the detailed microscopic structure of physical systems and the states of such systems
 - b. Statistics of grand systems
- B. The gaseous state of matter
 - 1. The nature and properties of a gas
 - 2. The thermodynamic approach to gases: the macroscopic view that deals with bulk measurable properties
 - a. The simple gas laws
 - b. The thermal equation of state for perfect gases
 - c. Empirical equations of state for real gases
 - 3. The particle-description approach to gases
 - a. The distribution function
 - b. The Boltzmann transport equation and the single-particle distribution function
 - c. The N-particle distribution function and the thermodynamic-equilibrium properties and transport properties of dense gases
 - d. The behaviour of a gas at the hydrodynamic and thermal relaxation stages
- C. The liquid state of matter
 - 1. The behaviour and properties of liquids at equilibrium
 - 2. The molecular structure of liquids based on distribution functions, which measure the probable distribution of some property of molecules through the liquid
 - 3. Properties of liquids
 - a. Transport properties
 - b. Acoustic properties: propagation of sound waves
 - c. Electrical and magnetic properties
 - d. Thermodynamic properties
 - e. Optical properties
 - f. Surface tension
- D. Solutions and solubility
 - 1. General classes of solutions: electrolytes and nonelectrolytes, solutions of weak electrolytes, endothermic and exothermic solutions
 - 2. Properties of solutions
 - a. Composition ratios: molarity, molality, mole fraction
 - b. Equilibrium properties: correlation of the vapour pressure of a solution to its composition
 - c. Colligative properties: rise in boiling point, decrease in freezing point, osmotic pressure
 - d. Transport properties: viscosity, thermal conductivity, diffusivity
 - 3. Thermodynamic and molecular aspects of solvent and solute interactions
 - a. Energy considerations: entropy, enthalpy, Gibbs free energy
 - b. Effects of molecular structure and weak intermolecular forces
 - c. Effects of chemical interactions; *e.g.*, hydrogen bonding, chemical combinations
 - 4. General theories of solution: the prediction of solubility and solution properties

- a. Solutions of nonelectrolytes: Raoult's law and Henry's law for ideal solutions; theoretical expressions for the excess properties of regular athermal, associated, and solvated solutions
- b. Solutions of electrolytes: Debye-Hückel theory and modifications, Arrhenius dissociation theory
5. Effects of temperature and pressure on the solubility of solids and gases
- E. Physical effects at surfaces
 1. Surface tension and surface energy: cohesion and adhesion
 2. Adsorption on liquid and solid surfaces
 3. Tribological phenomena, the mechanical and physical effects at interfaces: friction, wear, lubrication
 4. Colloids: the kinds of dispersions and their properties and preparation
 - a. Irreversible colloidal systems: lyophobic sols, emulsions, foams, pastes, gels
 - b. Reversible colloidal systems: solutions of polymers and proteins, solutions of soaps and dyes
- F. The plasma state of matter: completely ionized gases interacting with magnetic and electric fields
 1. Basic plasma properties and parameters: electrical quasineutrality, electron density, kinetic temperature, particle velocities, magnetic and electric field strengths
 2. Elastic and inelastic collisions of plasma particles
 3. Radiation from plasmas; *e.g.*, X rays, synchrotron radiation, excitation radiation
 4. The formation of plasmas
 5. The behaviour of plasmas in magnetic and electric fields
 6. The determination of plasma variables
 7. Fluidlike behaviour in plasmas
 8. Applications of plasmas; *e.g.*, power production, jet propulsion
[see 112.G.4., 721.B.8.a., and 721.C.3.]
 9. The existence of plasmas in nature: in the extraterrestrial medium, in the Sun and stars, on Earth
- G. The properties of matter at extreme conditions
 1. Properties of matter at low temperatures
 - a. Effects of low temperature on entropy, heat capacity, magnetic properties, and conductivity
 - b. Special physical phenomena at very low temperatures: superconductivity, superfluidity
 - c. Special methods for obtaining and characterizing low temperatures: adiabatic cooling, adiabatic dilution
 2. Special properties of matter at high temperatures
 3. Effects of high pressure on the physical, chemical, electronic, and magnetic properties of matter
- H. Transport phenomena
 1. The kinetic molecular theory of the transport properties of gases, liquids, suspensions, and polymers
 2. Phenomenological expressions of transport
 3. Hydrodynamic aspects of transport phenomena
 4. Transport phenomena in macrosystems

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with heat, thermodynamics, and the nonsolid states of matter

Matter: Its Properties, States, Varieties, and Behaviour
Physical Sciences, The
Thermodynamics, Principles of

MICROPAEDIA: Selected entries of reference information

General subjects

<i>colloids:</i>	caloric theory	phase rule	heat capacity
aerosol	convection	thermal fusion	internal energy
colloid	heat transfer	vaporization	Lagrangian
dialysis	thermal	<i>solutions and</i>	function
emulsion	conduction	<i>solubility:</i>	Maxwell's demon
foam	<i>liquid state of matter:</i>	amalgam	Rankine cycle
gel	capillarity	Arrhenius theory	reversibility
<i>gaseous state of</i>	detergent	exsolution	specific heat
<i>matter:</i>	diffusion	Henry's law	temperature
Avogadro's law	fluid	ideal solution	thermodynamics
Boyle's law	glass	saturation	<i>other:</i>
Dalton's law	liquid	solid solution	adsorption
degenerate gas	osmosis	solution	cohesion
diffusion	superfluidity	<i>thermodynamics</i>	friction
fluid	surface-active	<i>and statistical</i>	liquid crystal
gas	agent	<i>mechanics:</i>	plasma
kinetic theory of	surface tension	absolute zero	Stefan–
gases	<i>phase changes and</i>	canonical	Boltzmann law
Maxwell–	<i>equilibria:</i>	ensemble	thermal expansion
Boltzmann	boiling point	carnot cycle	transport
distribution law	condensation	energy,	phenomenon
mean free path	critical point	equipartition of	tribology
perfect gas	distillation	enthalpy	wear
van der Waals	eutectic	entropy	
forces	freezing point	free energy	
<i>heat transfer in</i>	latent heat	freedom, degree of	
<i>matter:</i>	melting point	Hamiltonian	
adiabatic	phase	function	
demagnetization	phase diagram	heat	

Biographies

See Section 10/32 of Part Ten

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Section 125. The Solid State of Matter**A. Crystals and crystallography**

1. Patterns of atoms in crystals
 - a. The three-dimensional periodic arrangement of atoms in crystals: crystal planes and their notation
 - b. Symmetry considerations in the classification of crystal systems
2. Diffraction of X rays, electrons, and neutrons by crystal structures
3. Processes of crystal growth
 - a. Theoretical aspects of crystal growth: energy considerations, growth of eutectics, constitutional supercooling, nucleation
 - b. Preparation of crystals: monocomponent and polycomponent crystal growth
4. Imperfections and dislocations in crystalline materials and their effects on the properties of the crystals
5. Effects of temperature, pressure, and alloying on the strength and hardness of crystals

B. The theory of the crystalline solid state

1. The classification of solids according to their electronic structure and bonding: ionic solids, covalent solids, metallic solids, molecular solids, hydrogen-bonded solids

2. The arrangement of atoms in crystalline solids
[see A.1.a., above]
 3. The elastic and plastic properties of solids
 4. The thermal and thermodynamic properties of solids: specific heat, thermal conductivity
 5. The electronic structure of solids
 - a. The nature and mobility of electrons in conductors, insulators, and semiconductors
 - b. Electron emission: thermionic emission, photoelectric emission, field emission
 - c. The nearly free electron approximation
 - d. The energy-band theory of the solid state
 6. The principal types of magnetic behaviour exhibited by solids: paramagnetism, diamagnetism, ferromagnetism
 7. The interaction of light with solids
 - a. The behaviour of solids illuminated with radiation: reflection, absorption, or transmission of photons
 - b. The generation of electromagnetic radiation from the energy supplied to the solid
 - c. The photoelectric effect
- C. Ionic crystals
1. Bonding in ionic crystals
 2. The structure of ionic crystals
 - a. Perfect ionic crystals
 - b. Defects in ionic crystals: Frenkel defect, Schottky defect, colour centres
 3. Properties of ionic crystals
 - a. Vibrational and electronic properties
 - b. Thermal properties
 - c. Polarizing and diffusion properties and the nature of ionic conduction
 - d. Optical properties
- D. Metals
1. Structural aspects of metals and alloys
 2. Elementary description of metals: the use of the free electron model to explain thermal and electrical conductivity of metals
 3. The electronic structure of metals and related effects
 - a. The interaction between the periodic lattice and the conduction electrons: the weak pseudopotential
 - b. Electron motion in a magnetic field and conduction-related effects
 4. Band structure and properties of metal groups: alkali metals, semimetals, noble metals, transition metals
 5. Lattice vibrations: interaction between ions; interaction between electrons, phonons, and dispersion
 6. Metal surface phenomena: thermionic and field emission of electrons, electron tunnelling, photoemission, free carrier absorption and interband transitions
 7. Many-body effects: plasma oscillations, spin waves, Fermi liquid theory, dynamic effects and shake-off electrons
 8. Superconductivity in metals
 - a. Thermal properties of superconductors: transition temperature, specific heat and thermal conductivity, energy gaps
 - b. Magnetic and electromagnetic properties of superconductors: critical field, Meissner effect, phase coherence effects
 9. Magnetic phenomena in metals: diamagnetism, paramagnetism, ferromagnetism, antiferromagnetism, nuclear magnetic resonance

E. Semiconductors and insulators

1. General properties of semiconductors and insulators
2. Mechanisms of conduction: mobility of charged particles and electrons in solids
3. Electrical conduction in semiconductors
 - a. Chemical approach: impurity conduction, hopping process
 - b. Physical approach: energy band and gaps, lattice vibrations, statistical properties
 - c. Extrinsic and intrinsic semiconductors
 - d. Measurement of conductivity and of energy gaps
4. Principles involved in semiconductor applications
 - a. Optical effects: photoelectric effect, photovoltaic effect, luminescence
 - b. Electrical and related effects: hot electron effects, thermoelectric effects
 - c. Junction effects
 - d. Pressure and stress effects

F. The glassy or amorphous state of matter

1. Effects of temperature and composition on glass properties
2. The structure of glass
3. General properties of glasses: mechanical, chemical, optical, and electrical properties

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the solid state of matter

Matter: Its Properties, States, Varieties, and Behaviour
Minerals and Rocks

MICROPAEDIA: Selected entries of reference information

General subjects

<i>crystal systems:</i>	polycrystal	photovoltaic effect	Bragg law
hexagonal system	single crystal	semiconductor	electronic work
isometric system	<i>electric currents and</i>	superconductivity	function
monoclinic system	<i>related effects:</i>	<i>structural features of</i>	exciton
orthorhombic	avalanche effect	<i>crystals:</i>	Fermi level
system	band theory	axis	Fermi surface
point group	BCS theory	Bravais lattice	free-electron model
space group	dopant	colour centre	of metals
tetragonal system	Gunn effect	Miller indices	Laue diffraction
triclinic system	Hall effect	polymorphism	pattern
trigonal system	hole	slip	liquid crystal
<i>crystals:</i>	insulator	Steno's law	magnon
crystal	Josephson effect	symmetry	metal
crystalline rock	Meissner effect	trap	metallography
crystallite	minority carrier	twinning	phonon
epitaxy	injection	vacancy	polaron
nucleation	mobility	<i>other:</i>	quasicrystal
optical	photoconductivity	allotropy	reststrahlen
crystallography	photoelectric effect	anisotropy	

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Section 126. Mechanics of Particles, Rigid Bodies, and Deformable Bodies: Elasticity, Vibrations, and Flow

A. The principles of classical mechanics

1. The fundamental parameters and concepts of classical mechanics: matter, space, motion, time
2. Statics, the equilibrium of systems at rest: force, friction
3. Dynamics: motion of systems
 - a. Kinematics: motion of particles and rigid bodies without consideration of the forces producing the motion
 - i. Velocity and acceleration
 - ii. Rotation about a fixed axis
 - iii. Motion in a circular path
 - iv. Simple harmonic motion
 - v. Relative motion
 - b. Kinetics: motion of bodies under the action of forces upon them
 - i. Newton's laws of motion: the law of inertia, the law of force, the law of action and reaction
 - ii. Motion under a constant force
 - iii. Ballistics: phenomena and laws of projectiles and their propulsion, flight, and impact
 - iv. The motion of the pendulum
 - v. Newton's law of universal gravitation
 - vi. Kepler's laws of planetary motion
 - c. Impulse and momentum
 - d. Work and power
 - e. Energy
 - i. The concepts of energy and energy conservation
 - ii. Forms of energy and examples of energy transformations associated with each energy form
 - iii. The equivalence of mass and energy
 - f. The conservation of momentum
4. Mechanics of nonrigid bodies
 - a. The collision of bodies or particles: centre of mass system, elastic collisions, inelastic collisions
 - b. Stiffness in mechanical vibrations
5. Motion in a rotating frame of reference: inertia forces and Coriolis forces
6. Mechanics of complex systems
 - a. The principle of virtual work
 - b. The rotation of spinning tops and gyroscopes
 - c. The precession and nutation of rotating bodies
 - d. Lagrange's and Hamilton's equations of motion

B. Celestial mechanics

1. The scope and history of celestial mechanics
2. The two-body problem and perturbations that cause the orbits of planets and satellites to deviate from ellipses
3. The three-body problem
4. The general n -body problem

- C. Relativistic mechanics in inertial systems of reference
 - 1. Mechanical foundations of special relativity
 - 2. Relativistic kinematics
 - 3. The relationship between gravitational mass and inertial mass
- D. The stress dynamics of elastic materials
 - 1. The phenomenon of elasticity: stress-strain relationships
 - 2. Elasticity in viscous and crystalline bodies
 - 3. Elastic constants
 - 4. The theory of elasticity: mathematical expressions defining elastic properties
- E. Vibrations of elastic bodies
 - 1. The nature of vibrations: natural or free vibrations, damped and forced vibrations
 - 2. Vibrators and their sources of energy
 - 3. Types of vibrational waves: their properties and modes of propagation
 - 4. The behaviour of materials undergoing vibration
 - 5. Detection and utilization of vibrations
[see 723.F.6. and 735.K.2.]
- F. Fluid mechanics, including gas dynamics
 - 1. General properties of fluids, ideal and actual: mechanical and thermodynamic properties
 - 2. Fluid statics and equilibrium
 - a. The basic equation of fluid statics
 - b. Fluid forces on plane and curved surfaces: analysis of forces, buoyancy, stability of floating and submerged bodies
 - 3. Fluids in motion: hydrodynamics and aerodynamics
 - a. Frictionless one-dimensional fluid flow
 - b. Flow in pipes and channels: laminar flow, turbulent flow, special types of flow
 - c. General two- and three-dimensional flow: mathematical conditions, vorticity, boundary layers, drag
 - d. Compressible fluid flow: isentropic flow, shock waves
- G. Rheological phenomena: deformation and flow
 - 1. Continuum mechanics
 - a. Kinematics of deformation and flow: strain, shear, compression, elongation
 - b. Dynamics: balance of forces and torques
 - 2. Constitutive equations: stress-deformation relations in different media
 - 3. Yield strength of materials: fracture and fatigue
 - 4. The application of molecular theories to explain rheological phenomena

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the mechanics of particles, rigid bodies, and deformable bodies: elasticity, vibrations, and flow

Energy Conversion

Matter: Its Properties, States, Varieties, and Behaviour

Mechanics: Energy, Forces, and Their Effects

MICROPAEDIA: Selected entries of reference information

General subjects

*deformation and
elasticity:*
bulk modulus

deformation and
flow
elasticity

Hooke's law
plasticity
shear modulus

slip
strain
stress

tensile strength	statics	laminar flow	periodic motion
yield point	velocity	Mach number	reduced mass
Young's modulus	<i>energy:</i>	Magnus effect	resonance
<i>elementary classical</i>	energy	Pascal's principle	simple harmonic
<i>mechanics:</i>	kinetic energy	Reynolds number	motion
acceleration	mechanical energy	terminal velocity	vibration
collision	potential energy	Torricelli's	<i>others:</i>
d'Alembert's	power	theorem	action
principle	work	turbulent flow	ballistics
dynamics	<i>fluid mechanics:</i>	viscosity	celestial mechanics
force	Archimedes'	<i>rotary motion:</i>	chaos
gravity, centre of	principle	angular	density
inertia	austausch	momentum	equilibrium
kinematics	coefficient	angular velocity	equivalence
kinetics	Bernoulli's	centrifugal force	principle
mass	theorem	Coriolis force	escape velocity
mechanics	boundary layer	couple	Kepler's laws of
momentum	capillarity	inertia, moment of	planetary motion
motion	cavitation	precession	pressure
motion,	convergence and	reduced mass	reference frame
equation of	divergence	torque	specific gravity
Newton's law of	eddy	uniform circular	statistical
gravitation	fluid	motion	mechanics
Newton's laws of	fluid mechanics	<i>vibrations:</i>	
motion	Froude number	damping	
position vector	hydraulics	pendulum	

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Section 127. Electricity and Magnetism

A. The static electric charge

1. General phenomena of static electricity
 - a. The basic laws of electrostatics that relate the interaction of charged bodies at rest
 - b. The electrostatic field
 - c. The electric dipole
 - d. Electrostatic energy and force
 - e. Electricity in the atmosphere
[see also 212.C., 221.A.3.b., and 223.B.2.]
2. Electrostatics of dielectrics and capacitors: polarization
3. Electrostatic potential
 - a. High-voltage phenomena
 - b. Electric fields and potential distributions in two and three dimensions
4. Measurement of electrostatic forces and fields
[see 723.D.1.e.]

B. Moving charges and electric currents

1. Direct electric current: current that flows in one direction
 - a. General phenomena of moving electric charges: definitions of electric quantities and their units
 - b. Electromotive force
 - c. Behaviour of direct currents in electric circuits: Ohm's law; Kirchhoff's laws; the principles of devices that measure or indicate the presence of current, potential difference, and resistance

2. The conduction of electricity
 - a. The motion of charged particles in an electric field
 - b. The mechanisms of the conduction of electricity: in a vacuum, in gases, in liquids and solids, in metals and semiconductors
 - c. Thermoelectric effects: phenomena in which electric energy is transformed into thermal energy or vice versa
 - d. Electron emission: thermionic emission, secondary emission, photoelectric emission
 3. Alternating electric currents: current that reverses itself with uniform frequency
 - a. Faraday's law of electromagnetic induction
 - b. The mathematical and graphical representation of alternating currents
 - c. Basic laws of alternating current circuits
 - d. The detection and measurement of alternating currents and voltages
[see 723.D.1.e.]
 - e. Parallel resonant circuits
 - f. Alternating current bridges for determining impedance
 - g. Propagation of electric waves in cables
 - h. Filters that select signals
 - i. Transient phenomena of alternating circuits
 - j. Eddy currents and skin, or surface, effects
 - k. Principles of generation and transmission of ac single- and multiphase power
 4. Primary effects and properties of electric fields and currents
 - a. Magnetic effects of steady electric currents
[see C.2., below]
 - b. Magnetic effects of changing currents
[see C.4., below]
 - c. Force, energy, and power associated with electromagnetic fields
 - d. The generation of electromagnetic radiation by the changing of currents in circuits
 5. Effects of electricity on matter
 - a. Piezoelectricity and applications of the phenomenon
 - b. Optical effects: electroluminescence, Kerr effect, Stark effect
 - c. Thermal effect: resistance heating
 - d. Chemical effects: electrolysis, electro-osmosis, electrophoresis
 - e. Bioelectric effects: effects associated with nerve, brain, and muscle action in which potential differences occur and can be influenced by applied potential
- C. Magnetism
1. General phenomena of magnetic systems
 2. Magnetic effects of steady electric currents
 - a. The magnetic field of steady currents: Ampère's law, the law of Biot and Savart
 - b. The magnetic moment of a current loop
 - c. The magnetic field of a solenoid
 3. Motion of charged particles in magnetic and electric fields
 - a. The force on a moving charge
 - b. Motion of charges in uniform flux density
 - c. Motion of charges in combined electric and magnetic fields
 - d. Magnetic dipole moments: atomic moments, nuclear moments, magnetic resonance
 4. Magnetic effects of varying currents
 - a. The laws of electromagnetic induction
 - b. Inductance and magnetic energy

5. Properties of magnetic materials
 - a. The classification of magnetic substances
 - b. Induced and permanent atomic magnetic dipoles
 - c. Magnetism of matter
 - i. Diamagnetism
 - ii. Paramagnetism
 - iii. Ferromagnetism
 - iv. Antiferromagnetism
 - v. Ferrimagnetism
 - vi. Terrestrial magnetism
[see also 212.B.]
 - d. Atomic structure and magnetism
- D. The theory of fields in physics
 1. The definition of a field in physics: the scope of field theory
 2. Mathematical treatment of fields
 3. Classification of fields: material and nonmaterial fields; scalar, vector, and tensor fields
 4. Examples of scalar, vector, and tensor fields in ordinary space
 5. Fields with distributions in more than three dimensions
- E. The electromagnetic field and the theory of electromagnetic radiation
 1. The classical theory of radiation
 - a. The development of concepts and theories concerning the nature of light
 - b. Semiquantitative treatment of electromagnetic radiation: Maxwell's equations for the electromagnetic nature of light
 - c. The electromagnetic spectrum
 2. The quantum theory of radiation
 - a. Evidences of the particle nature of electromagnetic radiation: Compton effect, photoelectric effect, Raman effect
 - b. The wave-particle duality of the photon
 - c. The interaction of electromagnetic radiation with atomic and molecular structures: absorption, emission, and scattering processes
 - d. The relation of electromagnetic radiation to quantum theory and relativity
 3. The mathematical formulation of electromagnetic theory
 - a. Maxwell's equations for electromagnetic fields and radiation
 - b. Transmission of radiation in free space
 - c. Wave equations in space bounded by conductors
 - d. Scattering of electromagnetic waves
 - e. Electromagnetic waves in material media
 - f. The functions of antennas
- F. Relativistic electrodynamics
 1. Electrodynamics in four-dimensional notation
 2. Applications of relativistic principles in the treatment of electromagnetic and nuclear force fields of relativistic particles

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with electricity and magnetism

Electricity and Magnetism

Electromagnetic Radiation

Energy Conversion

MICROPAEDIA: Selected entries of reference information

General subjects

<i>stationary electric charges and related phenomena:</i>	electricity	ether	<i>magnetism of matter:</i>
capacitance	electromotive force	infrared radiation	antiferromagnetism
Coulomb force	Faraday's law of induction	Maxwell's equations	Barkhausen effect
dielectric	inductance	Michelson-Morley experiment	Curie point
dielectric constant	Joule's law	Planck's radiation law	diamagnetism
electret	Kirchhoff's circuit rules	polarization	ferrimagnetism
electric charge	Lenz's law	Poynting vector	ferromagnetism
electric dipole	Ohm's law	radiation	hysteresis
electric displacement	Peltier effect	Raman effect	magnet
electric field	reactance	Stefan-Boltzmann law	magnetic dipole
electric polarization	resistance	thermal radiation	magnetic permeability
electric potential	resistivity	ultraviolet radiation	magnetic pole
electric susceptibility	Seebeck effect		magnetic susceptibility
electrostatic induction	Thomson effect	<i>magnetic effects of electric currents:</i>	magnetostriction
Stark effect	<i>electricity in the atmosphere:</i>	Ampère's law	paramagnetism
<i>electric currents and related phenomena:</i>	ball lightning	Biot-Savart law	<i>other:</i>
alternating current	lightning	displacement current	electrostriction
cathode ray	Saint Elmo's fire	magnetic circuit	ferroelectricity
charge carrier	<i>electromagnetic fields and the theory of electromagnetic radiation:</i>	magnetic field	Leyden jar
direct current	electromagnetic field	magnetic force	permittivity
electric current	electromagnetic radiation	magnetism	piezoelectricity
electrical impedance		magnetometer	Zeeman effect

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Section 128. Waves and Wave Motion**A. General wave phenomena and the theory of wave motion**

1. General properties of waves: frequency, amplitude, wavelength, phase
2. Classification of waves
 - a. Waves classified by the medium supporting the transmission of wave motion: water waves, sound waves, electromagnetic waves
 - b. Waves classified by the motion of particles in a wave: transverse, longitudinal, torsional, and cylindrical waves
 - c. Other classifications: bow waves and shock waves
3. The theory of waves
 - a. General characteristics of vibratory motion: periodicity, group velocity, energy content
 - b. The velocity of waves
 - c. The wave equation: the space-time description of wave motion
 - d. Transport of energy and momentum
4. The principle of superposition of waves
 - a. Standing waves: waves with stationary nodes

- b. Modulation of waves
 - c. Pulse and wave trains
- 5. The behaviour of waves at boundaries or interfaces: reflection, transmission, refraction
- 6. The diffraction and interference of waves
- 7. The interaction of waves with matter: absorption, dispersion
- B. Electromagnetic waves
 - 1. Properties and behaviour of electromagnetic waves
 - 2. Waves of the electromagnetic spectrum and their properties
 - a. Radio waves
 - b. Microwaves
 - c. Infrared radiation
 - d. Visible light
[see C., below]
 - e. Ultraviolet waves
 - f. X rays
[see 111.D.]
 - g. Gamma rays
 - 3. Sources of incoherent electromagnetic waves
 - a. Sources of radio waves: oscillators, antennas, cosmic objects
 - b. Sources of microwaves: klystrons, magnetrons, Gunn diodes, tunnel diodes, cosmic sources
 - c. Sources of infrared, visible, and ultraviolet waves
 - i. Blackbody radiation
 - ii. Luminescence, fluorescence, phosphorescence
 - iii. The passage of electrical current through a resisting medium
 - d. Sources of X rays: X-ray tubes (bremsstrahlung), synchrotron radiation
 - e. Sources of gamma rays: radioactive nuclei
 - 4. Sources of coherent electromagnetic waves: lasers and masers
 - 5. The transmission of electromagnetic waves: through matter, through space, by wave guides and transmission lines
- C. Light waves
 - 1. Light as a wave motion: the wave theory of light
 - a. The properties of light consistent with the wave theory: diffraction, interference, polarization, dispersion
 - b. The spectrum of light: the description of colour in terms of wavelengths
 - 2. The velocity of light and its measurement
 - 3. Interference of light
 - 4. Diffraction phenomena
 - 5. Polarization
 - a. Superposition of polarized beams: plane, circularly, or elliptically polarized light
 - b. Double refraction: waves in anisotropic media
 - c. Characterization of polarized light by Stokes's parameters and Poincaré sphere
 - 6. Properties and behaviour of light waves based on Maxwell's equations of electromagnetic theory
 - 7. The interaction of light with matter
 - a. Reflection and refraction

- b. Dispersion and scattering
 - c. Absorption: mechanical and chemical effects of light
- 8. The quantum theory of light: the photon
 - a. Observed photon phenomena: photoelectric effect, Compton scattering, Rayleigh scattering
 - b. The uncertainty principle in relation to the study of the phenomena of light
 - c. The detection and counting of photons
- 9. The separation of light into its constituent wavelengths, the analysis of light spectra
- 10. Sources of light
- 11. The biological effects of light, including photosynthesis
[see 322.A. and 335.B.]
- D. The focusing and imaging of light waves
 - 1. Geometrical optics: the geometry of light rays and their image-forming properties through optical systems
 - a. Theoretical considerations: law of reflection, law of refraction, Lagrange theorem, Gauss theory of lenses
 - b. Optical systems: components, applications, lens aberrations, brightness of image formed
 - 2. Optics and information theory
 - a. Optical data processing
 - b. Holography: a two-step image-forming process using coherent light
- E. Sound waves
 - 1. The nature and properties of sound waves
 - 2. Shock waves and their characteristics
 - 3. Sources of sound waves
 - 4. The reception of sound
 - 5. Applications of acoustics
 - a. Recording and reproduction
[see 735.F.]
 - b. Architectural and acoustical design
[see 733.A.8.]
 - c. Speech and music
[see 514.D.1. and 624.B.]
 - d. Military acoustical detectors
[see 735.J.2.]
 - e. Noise control
[see 733.A.8.]
 - 6. Physical aspects of musical sound
 - a. The special properties of musical sound: pitch, timbre, loudness; fundamentals and overtones
 - b. The production of sound waves by musical instruments

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with waves and wave motion

Colour	Optics, Principles of
Electromagnetic Radiation	Sound
Light	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>behaviour and</i>	amplitude	diffraction	double refraction
<i>properties of waves:</i>	beat	dispersion	Faraday effect
absorption	Brewster's law	Doppler effect	Fermat's principle

frequency	infrared radiation	lens	whistler
Huygens' principle	light	light modulator	white noise
interference	luminescence	magnification	<i>other:</i>
longitudinal wave	phosphor	mirror	aureole
moiré pattern	phosphorescence	optical image	Cellini's halo
Newton's rings	radiation	optics	halo
phase	rainbow	periscope	Michelson–Morley
Rayleigh scattering	spectrum	prism	experiment
reflection	thermoluminescence	projection screen	mirage
refraction	ultraviolet	projector	Mössbauer effect
Snell's law	radiation	pupil	Munsell colour
standing wave	X ray	relative aperture	system
transverse wave	<i>lasers and masers:</i>	spectroscopy	photoelasticity
wave front	laser	stereoscopy	pleochroism
wave motion	maser	<i>sound waves:</i>	Poynting vector
wave number	optical pumping	combination tone	Stokes lines
wave velocity	stimulated	loudness	wave-particle
wavelength	emission	overtone	duality
Young's	<i>manipulation of light</i>	pitch	
experiment	<i>waves:</i>	resonance	
<i>electromagnetic</i>	aberration	resonator	
<i>waves:</i>	aperture	shock wave	
chemiluminescence	collimator	siren	
colour	critical angle	sound	
electroluminescence	diffraction grating	sound barrier	
electromagnetic	diopter	sound intensity	
radiation	fibre optics	timbre	
ether	Fresnel lens	tone	
gamma ray	holography		

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Division III. The Universe: Galaxies, Stars, the Solar System

[For Part One headnote see page 21.]

The outlines in the three sections of Division III deal with the subject matter of cosmology and cosmogony, of astronomy, and of astrophysics.

Accounts of the complex instrumentation involved in these disciplines are set forth in Section 723 of Part Seven. Historical and analytical studies of the nature and scope of astronomy and astrophysics are set forth in Section 10/32 of Part Ten.

- Section 131. The Cosmos 51
- 132. Galaxies and Stars 53
- 133. The Solar System 56

Section 131. The Cosmos

A. The structure and properties of the universe

1. Basic data for the universe

- a. The estimated chemical composition of the universe
[see also 121.D.]
- b. The large-scale structure and behaviour of the universe: evidence that the universe is expanding, Hubble's law and the theory of the red shift
- c. The age of the universe
- d. The clustering of galaxies
- e. Cosmic microwave background radiation

- f. The missing mass problem
 - g. Space-time: a four-dimensional continuum used to describe the universe
- 2. Cosmological models: theoretical representations of the original behaviour of the universe
[see E.1., below]
- 3. The known and postulated components of the universe
 - a. Distant galaxies
[see 132.A.]
 - b. The Local Group of galaxies
[see 132.A.1.c.]
 - c. Quasars and related objects, including such hypothetical phenomena as supermassive black holes at the centres of galaxies
 - d. Nebulae
 - e. Stars and stellar groups
[see 132.C. and 132.D.]
 - f. Planetary systems: solar and extrasolar systems
[see also 133.A.]
- B. Gravitation: a universal force of mutual attraction that is postulated as acting between all matter
 - 1. Development of gravitational theory
 - a. Early concepts: the Aristotelian viewpoint, contributions of Kepler and Galileo
 - b. Newton's law of gravity
[see also 126.A.3.b.v.]
 - 2. Interpretation of gravity measurements
 - a. Potential theory: mathematical representation of the gravitational fields of irregular mass distributions
[see also 10/22.D.2.c.]
 - b. Effects of local mass differences: measurement of small gravity anomalies
 - 3. Modern gravitational theory and its relation to other aspects of physical theory
 - a. Field theories of gravity and their general properties and predictions
 - b. Gravitational fields and the general theory of relativity: principles and consequences
[see D.2., below]
 - 4. Acceleration of gravity on the Earth's surface
[see 212.A.]
 - 5. The gravitational constant, G : methods of measurement, possible variation in time and space
- C. Celestial mechanics
[see 126.B.]
- D. Properties of the space-time continuum: the astronomical implications of relativity theory
 - 1. The special theory of relativity
 - a. Historical background: the search for the ether
 - b. Relativity of space and time
 - c. Consequences of the special theory
 - 2. The general theory of relativity
 - a. Use of relativity to interpret gravitational phenomena
 - b. Experimental confirmation of the theory
 - c. Implications of general relativity
- E. The origin and development of the universe
 - 1. The development of the universe as a whole
 - a. Big-bang versus steady-state models of the universe

- b. Primordial nucleosynthesis
- c. The early universe: extrapolations backward in time to the beginning of the universe
2. The formation and development of components of the universe: galaxies, stars, the solar system [see also 132.B., 132.D., and 133.A.]
 - a. The origin and development of galaxies: protogalaxies
 - b. The formation and development of stars
 - c. The origin of the solar system
3. Time scale of the universe: dating of significant events in the history of the universe
4. Theories of the possible fate of the universe

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the cosmos

Analysis and Measurement, Physical and Chemical
 Cosmos, The
 Gravitation
 Physical Sciences, The
 Relativity

MICROPAEDIA: Selected entries of reference information

General subjects

<i>cosmology:</i>	<i>element synthesis:</i>	free-fall	Lorentz–
big-bang model	carbon cycle	gravitation	FitzGerald
cosmology	nucleosynthesis	gravitational radius	contraction
cosmos	proton-proton	Newton’s law of	relativistic mass
expanding universe	cycle	gravitation	relativity
Great Attractor	<i>extraterrestrial life:</i>	weight	time dilation
Hubble’s constant	Green Bank	weightlessness	<i>other:</i>
Mach’s principle	equation	<i>relativity:</i>	cosmic ray
Olbers’ paradox	Ozma, Project	Einstein’s mass–	ephemeris
quasar	<i>gravitation:</i>	energy relation	Scorpius X-1
steady-state	Cavendish	equivalence	supernova
theory	experiment	principle	

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Section 132. Galaxies and Stars

A. Galaxies in general

1. Statistical properties
 - a. Classification of galaxies
 - b. Observational methods of determining the distances to galaxies
 - c. Distribution of galaxies
2. Physical properties: size, mass, luminosity, age, composition
3. Structural features
4. Clusters of galaxies
 - a. Types and distribution
 - b. Interactions between cluster members

5. Extragalactic radio and X-ray sources
 - a. Radio galaxies
 - b. X-ray galaxies
 - c. Quasars
6. The origin and evolution of the galaxies
[see also 131.E.2.]

B. The Galaxy: the Milky Way system

1. Distance determinations in the Galaxy
2. Stellar velocities: the motions of stars with respect to the Sun, the motion of the Sun with respect to the Local Standard of Rest (LSR)
3. The stars and star clusters nearest the Sun
4. The classification of stars according to the Hertzsprung–Russell diagram
5. The galactic composition
 - a. The stellar populations
 - b. Emission nebulae: composition and physical characteristics of H II regions
 - c. Planetary nebulae
 - d. Supernova remnants
 - e. Dust clouds
 - f. The general interstellar medium: principal components and their distribution throughout the various galactic regions
 - i. Grains of interstellar dust
 - ii. Interstellar clouds of neutral hydrogen (H I regions)
 - iii. Interstellar molecules and radicals
 - g. Primary cosmic rays
 - h. Interstellar magnetic fields
6. Structure and dynamics of the Galaxy
 - a. The spatial structure of the Galaxy: the dimensions of the Galaxy
 - b. Regions of the Galaxy: the nucleus, the central bulge, the disk, the spiral arms, the spherical component, the massive halo
 - c. The magnetic field of the Galaxy: its origin and its effects on cosmic rays, radio waves, and light
 - d. The rotation of the Galaxy: the differential rotation of stars, gas about the galactic centre
7. The evolution of the Galaxy
[see also 131.E.2.]
 - a. Hydromagnetic and gravitational theories of the formation of spiral structure
 - b. Chemical evolution: the problem of the distribution of heavy elements
 - c. Star formation: theories concerning the gravitational condensation of galactic dust and gas clouds

C. Star clusters and stellar associations

1. Globular clusters: systems containing many thousands to a million old stars in a symmetrical, roughly spherical form
2. Open clusters: systems containing about a dozen to hundreds of stars, usually in an unsymmetrical arrangement
3. Stellar associations: loose groupings containing dozens to a few hundred stars of similar spectral type and common origin
4. Relationship of clusters to the Galaxy: the formation and dispersion of clusters and their locations in the Galaxy
5. Clusters in external galaxies

D. Stars

1. The identification and nomenclature of the stars
 - a. The celestial sphere and celestial coordinate systems
 - b. The constellations and other sky divisions
 - c. Star names and designations
 - d. Modern star maps and catalogs
2. Observable stellar characteristics
 - a. Stellar positions and motions
 - b. The apparent brightness or apparent luminosity of the stars: the UBV and other systems
 - c. Stellar spectra
[see also 111.C.]
3. Derived, or calculated, stellar characteristics
 - a. Intrinsic stellar brightness: absolute magnitudes, total luminosities
 - b. Stellar masses
 - c. Stellar diameters
 - d. Stellar temperatures
 - e. The average characteristics of main-sequence, or dwarf, stars
4. Stellar variability
 - a. Geometric variables; *e.g.*, eclipsing binaries
 - b. Intrinsic variables
 - i. Pulsating stars; *e.g.*, Cepheid, RR Lyrae, and Beta Canis Majoris variables
 - ii. Explosive variables; *e.g.*, novae, supernovae, and novalike variables
5. Statistics of stars
 - a. Correlations between luminosity, spectrum, mass, and radius: the Hertzsprung–Russell diagram and other relations
 - b. Statistics of binary star systems
 - c. Statistics of special types of stars
6. Stellar structure
 - a. Stellar atmospheres
 - b. Internal structure of stars
7. Stellar evolution
[see also 131.E.2.]
 - a. The life history of a typical star
 - i. Formation of a protostar by gravitational contraction
 - ii. Attainment of the main sequence
 - iii. Evolution away from the main sequence
 - iv. Estimates of stellar ages
 - b. Formation of chemical elements in stars
 - c. Probable fates of stars: white dwarfs, neutron stars, black holes

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with galaxies and stars

Cosmos, The
Galaxies
Nebula
Physical Sciences, The
Stars and Star Clusters

MICROPAEDIA: Selected entries of reference information

General subjects

<i>astronomical catalogs and instruments:</i>	<i>galaxies:</i>	21-centimetre radiation	nucleosynthesis
AG catalog	Andromeda	<i>star pairs and groups:</i>	Populations I and II
Almagest	Galaxy	binary star	proton-proton cycle
armillary sphere	Cygnus A	eclipsing variable star	white dwarf star
astronomical map	galaxy	Pleiades	<i>variable stars:</i>
Carte du ciel	Maffei I and II	star cluster	Cepheid variable
celestial globe	Magellanic Cloud	stellar association	eclipsing variable star
Henry Draper Catalogue	Milky Way Galaxy	<i>stars:</i>	flare star
Hertzsprung- Russell diagram	Seyfert galaxy	Algol	light curve
Messier catalog	Virgo A	Alpha Centauri	long-period variable star
New General Catalogue of Nebulae and Clusters of Stars	<i>nebulae:</i>	Barnard's star	nova
star catalog	Crab Nebula	Betelgeuse	supernova
<i>constellations:</i>	Cygnus Loop	Bethlehem, Star of	T Tauri star
Aquarius	Horsehead Nebula	colour index	U Geminorum star
Aries	Lagoon Nebula	Eta Carinae	variable star
Cancer	nebula	Fomalhaut	<i>other:</i>
Capricornus	North American Nebula	Harvard	degenerate gas
constellation	Orion Nebula	classification	galactic coordinate
Crux	Ring Nebula	system	H I region
Gemini	Strömgren sphere	Kepler's Nova	H II region
Leo	30 Doradus	magnitude	infrared source
Orion	Trifid Nebula	Mira Ceti	interstellar medium
Pisces	<i>radio and X-ray</i>	Sirius	light-year
Sagittarius	<i>emission:</i>	star	limb darkening
Scorpius	cosmic ray	Sun	parallax
Taurus	forbidden lines	Tycho's Nova	parsec
Ursa Major	pulsar	<i>stellar evolution:</i>	
Virgo	radio source	black hole	
	red shift	carbon cycle	
	Sagittarius A	Chandrasekhar limit	
	Scorpius X-1	giant star	
	synchrotron radiation	neutron star	

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Section 133. The Solar System**A. A survey of the solar system****1. The Sun**

[see B., below]

2. The major planets of the solar system, their surfaces and atmospheres, their satellites

[see C., D., and E., below]

3. Other constituents of the solar system**a. Minor planets, or asteroids****b. Comets****c. Meteoroids, meteors, and meteorites****d. The interplanetary medium****4. Regularities of the solar system: the distances of the planets from the Sun, the distribution of natural satellites**

5. Interactions among various bodies in the solar system: gravitational perturbations, actual physical encounters
6. Theories of the origin of the solar system: origin by an orderly process, origin by catastrophe
[see also 131.E.2.c.]

B. The Sun

1. The Sun's surface layers and their features: the quiet Sun
 - a. Solar data derived from observations of the photosphere, the visible luminous surface of the Sun
 - b. The chromosphere, the relatively transparent layer that forms a transition zone between the Sun's photosphere and corona: the flash spectrum, spicules, supergranulation
 - c. The corona, the luminous, high-temperature, rarefied gas envelope of the Sun: form, structure, physical properties; the solar wind
2. Solar features that occur with increased frequency during the active phase of the solar cycle: the active Sun
 - a. Centres of activity: areas of localized strong magnetic fields at the Sun's surface
 - b. Sunspots: their physical nature, the sunspot cycle of about 11 years
 - c. Other features; *e.g.*, faculae, prominences, flares, coronal condensations
3. The solar interior: energy generation, the evolution of the Sun
[see also 132.D.7.]
4. Solar radiation, including light, radio waves, and particles
5. Solar-terrestrial relationships and interactions

C. The planets and their satellites

1. The terrestrial planets
 - a. Mercury
 - b. Venus
 - c. Earth
[see D., below]
 - d. Mars
2. The minor planets, or asteroids
[see A.3.a., above]
3. The giant planets and Pluto
 - a. Jupiter
 - b. Saturn
 - c. Uranus
 - d. Neptune
 - e. Pluto

D. The Earth as a planet

1. The distance of the Earth from the Sun: the astronomical unit and solar parallax
2. The orbital motion of the Earth around the Sun and the rotation of the Earth on its axis: the year, the day, the precession of the equinoxes
[see also E.7.a., below]
3. Effects of the Earth's orbital position and speed on astronomical observations
 - a. Astronomical parallax
 - b. Aberration of light
4. The Earth's magnetism, temperature, and other physical properties
[see 212]
5. The structure and composition of the Earth's interior
[see 213]
6. The origin of the Earth, its atmosphere, hydrosphere, and surface features
[see 232 and 241]

E. The Moon

1. The shape, radius, mean density, and varying brightness of the Moon
2. The motion of the Moon
 - a. The apparent motion: the month, or sidereal and synodic periods of the Moon; optical and physical librations
[see 7.a.ii., below]
 - b. The actual motion
3. The mass and gravitational field of the Moon
 - a. Underlying theory: basic gravitational properties of the Moon
 - b. Discovery of lunar mascons: gravity anomalies on the Moon
4. The physical nature of the Moon
 - a. Observations from Earth and from space vehicles: results of remote lunar photography, manned lunar landings, and close-up photography
[see also 738.C.]
 - b. The lunar surface features: craters, lineaments (*e.g.*, mare ridges, the lunar grid system, rilles), temporary or transient features
 - c. Theories of origin of the Moon's surface features: the volcanic and impact theories
5. The origin and evolution of the Moon
 - a. Probable development of the Moon's orbit
 - b. Evidence from the composition and physical properties of the Moon
6. The chemical nature of the Moon
 - a. Surface composition: findings of the chemical analysis of lunar rock samples
 - b. Possible zonal variations of the interior
7. The Sun–Earth–Moon system
 - a. Relative motions of the Sun, Earth, and Moon
 - i. The geometry of the Sun–Earth–Moon system: the celestial equator, the apparent motion of the Sun along the ecliptic, the inclination of the Earth's axis to its orbit
 - ii. Motions of the Sun–Earth–Moon system as the astronomical basis of chronology: the day, month, and year; the Sothic cycle, Metonic cycle, and other complex cycles
 - b. Eclipses of the Sun and Moon
 - c. Tides in the Earth and in the Moon
[see also 222.G.3.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the solar system. See also Section 211 of Part Two

Calendar

Earth, The: Its Properties, Composition, and Structure

Eclipse, Occultation, and Transit

Physical Sciences, The

Solar System, The

MICROPAEDIA: Selected entries of reference information

General subjects*calendars:*

Aztec calendar

calendar

Chinese calendar

day

Dionysian period

Egyptian calendar

French republican
calendar

Greek calendar

Gregorian calendar

intercalation

international date
line

Jewish calendar

Julian calendar

Julian period

leap year

lunar calendar

Mayan calendar

month	Icarus	eclipse	heliopause
Muslim calendar	Pallas	ecliptic	limb darkening
perpetual calendar	Ra-Shalom	equinox	photosphere
Roman republican calendar	Trojan planets	equinoxes,	solar cycle
solar calendar	<i>Moon:</i>	precession of the	solar energy
Tibetan calendar	Cassini's laws	heliocentric system	solar flare
week	Copernicus	nutration	solar nebula
year	libration	occultation	solar
<i>comets:</i>	Linné	orbit	prominence
Arend-Roland,	Mare Orientale	orbital velocity	solar radiation
Comet	Moon	parallax	solar wind
comet	Tycho	phase	Sun
Encke's Comet	<i>Neptune:</i>	Ptolemaic system	sunspot
Halley's Comet	Neptune	retrograde motion	<i>Uranus:</i>
<i>Jupiter:</i>	Nereid	solstice	Ariel
Amalthea	Triton	synodic period	Miranda
Callisto	<i>objects of</i>	tidal friction	Oberon
Europa	<i>extraterrestrial</i>	tide	Titania
Ganymede	<i>origin:</i>	Tychonic system	Umbriel
Great Red Spot	achondrite	zodiac	Uranus
Io	carbonaceous	<i>Pluto:</i>	<i>Venus:</i>
Jupiter	chondrite	Charon	Venus
<i>Mars:</i>	chondrite	Pluto	<i>other:</i>
Chryse Planitia	chondrule	<i>Saturn:</i>	albedo
Deimos	meteor	Dione	Bode's law
Mars	meteor shower	Enceladus	celestial mechanics
Olympus Mons	meteorite	Iapetus	Forbush effect
Phobos	meteoritics	Mimas	gegenschein
Syrts Major	meteoroid	Phoebe	interplanetary
Tharsis	Orgueil meteorite	Rhea	medium
Utopia Planitia	tektite	Saturn	mare
<i>Mercury:</i>	Tunguska event	Tethys	planet
Caloris	<i>planetary motion:</i>	Titan	Planet X
Mercury	aberration,	<i>Sun:</i>	planetesimal
<i>minor planets:</i>	constant of	chromosphere	quadrature
asteroid	anomaly	corona	rille
Eros	conjunction	facula	satellite
	Copernican system	flash spectrum	solar system

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Introduction to Part Two: The Great Globe Itself

by Peter J. Wyllie

We all have a sense of awareness and appreciation of the Earth; we all admire the scenery. One of the rewards of studying and understanding the Earth is the development of this sense to a greater extent. This development brings us closer to nature, closer to an awareness of some transcendental power, closer to God if we choose to define God in these terms. To “commune with nature” is to seek peace, but of course the Earth is not always peaceful and benevolent; sometimes it is powerful and savage. Even cities, the culmination of man’s domination of the landscape, are not immune to the ravages of nature. They have been devastated by floods, wracked and ripped by tornadoes and hurricanes, ruined by ash or lava from volcanoes, and demolished by earthquakes. These events, too, we wish to understand.

Man’s appreciation of the Earth begins with physical contact. This immediate experience of the senses is followed by the spiritual desire and need to understand where the Earth and its human observers came from, and why. The third stage of appreciation comes from scientific analysis and interpretation. Before we examine the relationship between man and the Earth in more detail, we should consider our position in the solar system and the universe.

Human civilization has developed and flourished in a small niche in space. Our home is perched on the surface of a sphere, enormous to us but tiny compared to the universe, that spins around its axis once each day while moving at a fantastic speed around the Sun, completing an orbit once each year. Although normally unaware of it, we too are spinning and moving at the same speed as the Earth, but we are held securely on the surface by the gravitational attraction of the mass of rocks beneath us.

The Sun, a huge globe of burning gas, provides the energy that fuels the activities and processes of our immediate environment, the boundary layer between the rocky surface of the Earth and the fluid envelope of air and water that separates the Earth from the starkness of space. The air and water nurture life and simultaneously protect it from the potentially damaging radiation and particles that approach the Earth from other parts of the solar system and beyond.

A view of the Earth from space differs markedly from what we see from within our own restricted environment at the Earth’s surface. From where we stand, it appears that the Sun, the Moon, and the stars are moving in great arcs around the Earth, and it was once believed that this was the way of the universe. Man on his world was surely the centre of all things. But we know now that this is only a relative picture; although the Moon does orbit the Earth, the Earth–Moon system moves around the Sun, which is itself speeding through the universe.

We exist because the Earth exists, and we claim the Earth as our own by referring to it as Mother Earth, the universal provider. The Earth provides all of our material

needs and satisfies some of our spiritual needs: “I will lift up mine eyes unto the hills, from whence cometh my help.” A day in the mountains, at the seashore, or in the countryside sharpens that sense of awareness of the Earth which was compared above with an awareness of God.

Since he first appeared on Earth, man has wondered at nature’s awesome beauty and trembled at its indomitable power. The dread engendered by the physical experience of nature on the rampage, in storms, floods, or earthquakes, has shaped the development of primitive religions. Mystical or sacred attributes were assigned to natural objects and phenomena, and ceremonies were devised to honour and placate the unknown powers. Modern man has become increasingly insulated from his natural surroundings, partly because he is separated from them by masses of concrete, partly because scientific investigation tends to dispel the mystery of nature. This is not to imply that no problems remain to be solved, but we have learned enough to be reasonably sure that all are ultimately explicable in terms of rational science. Therefore, we no longer feel the need to populate the sky, mountains, trees, and winds with gods, spirits, and souls. But we can still enjoy the sensuous and spiritual appreciation of the Earth and retain or rediscover the intimacy with our natural surroundings that was experienced by primitive man.

One of the appealing aspects of Earth study is that wherever we go, our favourite subject is right there with us. There is always something new to be seen, to be admired, or to be examined in detail. While traveling in a commercial airliner, a meteorologist can examine the upper portions of the clouds as a change from his normal ground-based view and can track the flight right through the fronts and the high- and low-pressure regions charted on the newspaper weather map in his lap. An oceanographer flying over the coastline can see at a glance the large-scale patterns in the waves rolling shoreward and the effect of coastal prominences on these patterns. A geologist peering through the plane window can examine the distribution of hills and valleys laid out below him, gaining a bird’s-eye view to supplement the pattern of features that he had previously seen only on maps. These pleasures are not reserved for the professional Earth scientist. Anyone can observe the Earth and Earth processes in action, almost anywhere.

Man is a curious species; he needs to know how and why things happen. The simple, visual pictures of nature are beautiful, awe-inspiring, and on occasion terrifying, but they can be more satisfying if they invoke a series of additional images. Just as one’s appreciation of any work of art is enhanced by knowing something of the artist and his position in art history, so one’s appreciation of nature’s pictures is enhanced by knowing something about natural history. For a full appreciation of the splendour of mountain peaks rising abruptly from the plains, reaching

for the puffs of cloud that ride above them, we need to know something of the processes that raise mountains—or were they always there? We need to know something of the winds that carry moisture from the oceans to the skies, because we see that the clouds come, change their shapes, and then disappear. We can gain a great deal by learning a little about the scientific approach to appreciation of the Earth. And it is not at all difficult for the nonprofessional to read about and to understand many of the necessary concepts.

Two of the most troublesome concepts are time and size—dimensions that distinguish the Earth sciences from any other Earth-bound subject. It is very difficult for us to grasp the meaning of the statement that the Earth formed 4,600,000,000 years ago. Similarly, the enormous volume of water in the oceans or the volume of rocks in a mountain range almost defy comprehension. We have been considering the Earth and scenery as it is exposed to us at the present. But when we study the Earth, we realize that the present scenery is merely a transient feature in the immense span of geological time. Early students of the Earth were hampered by the belief that the Earth was only a few thousand years old. Many of them were seeking answers to two recurrent questions that we find throughout human history. How and when was the Earth formed? How and when was man formed? Attempts to answer these questions are responsible for many myths and religions in various cultures, both ancient and modern.

In the early part of the 19th century the study and interpretation of rocks led geologists to conclude that the Earth must be of far greater antiquity than the age implied by a literal interpretation of the Bible. They realized that the layers of rock now exposed at the surface contain records of the history of the Earth during the times that each layer was formed. One major branch of the Earth sciences is devoted to the discovery, translation, and interpretation of the “record of the rocks.” Many rock layers enclose fossils, and these remnants of animals and plants serve as illustrations in the historical book of nature, making it possible to trace the development and changes of species through time.

Fossil hunting has been a popular pastime for many generations. With a little experience and a little knowledge, an amateur fossil hunter can add interpretation to his discoveries. From a few fossil shells and corals in a limestone, he can reconstruct in his mind’s eye the whole flourishing community of life that once existed on a coral reef, now frozen into the rock record. A piece of coal, with fossil imprints of leaves, ferns, and other plant remains from which the coal was formed, can conjure up a picture of a luxuriant swamp of 300,000,000 years ago, populated by strange beasts long since vanished from the Earth. The history of the Earth, the evolution of life, and the origin of man, at least in part, are preserved in the rocks. It is here that fundamentalists still supporting “creationism” will find much evidence for the evolution of life forms, if they care to examine it. This aspect of Earth study has almost universal appeal. Earth history and human history overlap in archaeology, and the records of early civilizations exposed in excavation sites always excite public curiosity.

The scientific approach to the appreciation of nature informs us that the key to interpretation of the past history

of the Earth from the record of the rocks lies in processes occurring at the present time. These processes have been grouped into great cycles. Two of the most important are the hydrologic cycle, concerned with the circulation of water, and the mountain-building cycle.

The oceans constitute a vast reservoir for the hydrologic cycle. The atmosphere and the oceans are in constant motion, driven by the energy from the Sun and the rotation of the Earth. Masses of humid air, carrying water that has evaporated from sun-drenched tropical oceans, migrate to cooler latitudes, where the water is precipitated as rain or snow and thus returned to the ocean reservoir either directly or indirectly, over or through the ground. The moving air masses and ocean currents bring to the continental masses rain or drought, heat or cold, making them hospitable, habitable, or uninhabitable for human colonies. Minor changes in atmospheric circulation have converted fertile plains to barren deserts and caused major changes in the development of ancient civilizations.

The hydrologic cycle shapes our local environment. The features that we know collectively as scenery are produced mainly by flowing water, although ice, wind, and solar energy also contribute. The force of gravity and the rivers together carry the products of weathering downhill to the ocean reservoir. The average rate at which the surface of the land is being worn down and the land dispersed into the oceans is a trivial 1.5 inches per 1,000 years, but the dimensions of geological time gives significance to small numbers. At this rate, all of the continents would be worn down to sea level within 20,000,000 years. This means that during the 4,600,000,000 years since the Earth was formed, the continents could have been worn down to sea level at least 200 times. By now there should be no land rising above sea level, but we still see high mountains.

The mountains exist and persist because the effects of the hydrologic cycle are offset by the mountain-building cycle. Forces within the Earth cause large regions of the surface to rise very slowly, imperceptibly in human terms. Imperceptible, that is, until an earthquake signals an abrupt movement in the continuing process of mountain building. While some parts of the Earth rise, other regions sink. This slow rhythm has been termed “the pulse of the Earth.” Although we do not understand the details of what is happening within the Earth, we are now confident that internal forces are responsible for shaping the major features of the Earth’s surface, such as the distinction between continents and ocean basins and the persistence of mountain ranges on the land and beneath the ocean. The detailed sculpture of the surface results from the conflict between the mountain-building cycle and the hydrologic cycle.

The internal forces do more than cause the land surface to rise and fall; they cause the land to move sideways as well. It is now generally believed by most scientists that the continents drift. There is persuasive evidence that the surface of the Earth is covered by a small number of very large shell-like plates, about 60 miles thick, across which the continents are scattered rather like logs frozen into the ice on a lake. The rigid shells of rock slide over the Earth’s interior, carrying the continents with them and grinding against each other along their edges like ice floes. The plate boundaries are sites of geological activity: earthquakes and

volcanoes are concentrated along them. Because of these movements, supercontinents have been rifted apart, and ocean basins have opened, expanded, and closed again as continents collided. Collisions of continents have thrust up great mountain ranges such as the Himalayas. The continents are still drifting at rates of an inch or two per year: the Atlantic Ocean is increasing in size, and the Pacific Ocean is becoming smaller. Most people are fascinated by the theory of continental drift. The theory is not only aesthetically pleasing but also has practical applications.

What stokes the subterranean fires that drive the Earth's engine, causing continental drift, mountain building, volcanic eruptions, and earthquakes? We have no satisfactory answer to this question, but we do know that an enormous amount of energy is involved in the activity along the plate margins. One major earthquake releases more energy than a hydrogen bomb. Modern man is a powerful animal, thanks largely to his exploitation of the Earth for material and energy, and he dominates the landscape like no species before him. He feels reasonably secure in his command of the environment while contemplating the urban scene, because the landscape is largely a product of

his industry, and it is clearly subservient to his wishes and his computer-operated control panels. But when the Earth releases a minute fraction of its internal energy in a major earthquake, man becomes helpless. All control is lost while the surface of the Earth rises and falls in solid waves.

Man cannot live in harmony with his environment during an earthquake. It has become clear, however, that he must learn to do so at other times if he is to avoid the dire predictions of those who evaluate such factors as projected world populations, the material and energy resources of the Earth, projected rates of consumption of these resources, and the volume and toxicity of waste materials discarded. We live in a restricted environment with finite space and resources, and we have become a force producing major modifications in the environment at rates very rapid compared with normal rates of Earth evolution. Social decisions about the continued exploitation of the Earth should be made with full information about the problems, and social decisions are based on votes, in theory at least. This alone is sufficient reason for any intelligent person to inform himself about the Earth, quite apart from the fascination of the subject, because his future depends upon it.

Part Two. The Earth

Several points about the relations of this part to other parts should be noted. The consideration here of the Earth's physicochemical properties presupposes the physical and chemical knowledge and theories set forth in Part One. Knowledge of the Earth is in turn presupposed by Parts Three, Four, and Five, which are Life on Earth, Human Life, and Human Society, respectively. The several Earth sciences have themselves been the objects of historical and analytical studies concerned with their nature, scope, methods, and interrelations. These studies are set forth in Section 10/33 of Part Ten. The instrumentation used in the Earth sciences is dealt with in Section 723 of Part Seven.

- Division I. The Earth's Properties, Structure, and Composition 65
 - II. The Earth's Envelope: Its Atmosphere and Hydrosphere 73
 - III. The Earth's Surface Features 79
 - IV. The Earth's History 85

Division I. The Earth's Properties, Structure, and Composition

The outlines in the four sections of Division I treat the Earth as a planet; the Earth's physical properties; the structure and composition of the Earth's interior; and the Earth's constituent minerals and rocks.

- Section 211. The Planet Earth 65
 - 212. The Earth's Physical Properties 66
 - 213. The Structure and Composition of the Earth's Interior 68
 - 214. The Earth's Constituent Minerals and Rocks 69

Section 211. The Planet Earth

- A. The orbital motions of the Earth
 - 1. The revolution of the Earth about the Sun, the rotation of the Earth on its axis
 - 2. Forces and dynamic effects related to the rotation of the Earth
 - a. The Coriolis force
 - b. The effects of centrifugal force
 - c. Tidal friction
- B. The figure of the Earth
 - 1. The conventional definition of the figure of the Earth: the geoid
 - 2. The development of improved approximations to the Earth's size and shape
 - 3. The world geodetic system: the measurement of geodetic parameters
 - a. The astrogravimetric method
 - b. Satellite measurements
 - c. Correlation of data from different methods
 - 4. International reference systems: standard reference figures, precision measurements and their implications concerning global structure and processes

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the planet Earth

Earth, The: Its Properties, Composition, and Structure
Solar System, The

MICROPAEDIA: Selected entries of reference information

General subjects

atmosphere	Earth tide	latitude and	sea level
biosphere	equator	longitude	seafloor spreading
continent	geoid	North Pole	hypothesis
continental drift	hydrosphere	ocean	South Pole
Coriolis force	isostasy	orbit	tide
Earth	landform	plate tectonics	

Biographies

See Section 10/33 of Part Ten

INDEX: See entries under all of the terms above

Section 212. The Earth's Physical Properties**A. The Earth's gravitational field**

[see also 131.B.]

1. Characteristics of the terrestrial field
2. Measurement of gravitational acceleration
[see also 723.D.2.d.]
3. Interpretation of gravity data: inferences about the Earth's interior
 - a. Isostasy: the approximate balance between the elevation of the Earth's surface and the density of the rocks below
 - b. Gravity anomalies

B. The Earth's magnetic field

1. Measurement and representation of magnetic fields
2. Sources and characteristics of the Earth's main magnetic field
3. Variations in the main magnetic field, including polarity reversals, magnetic storms, magnetospheric substorms, and magnetic pulsations

C. The Earth's electrical properties

[see also 127.B.]

1. Currents produced by the motion of charged particles in the Earth's ionosphere
[see also 221.A.3.b]
2. Electrical conductivity and dielectric behaviour of the Earth's rocks and minerals
3. Currents induced by magnetic-field variations, currents generated by the Earth's core

D. The Earth's thermal properties

[see also 124.A.4.c.]

1. Sources of the Earth's heat
[see also 112.C.5.]
2. Transmission of heat from the Earth's interior to its surface: thermal conductivity and gradients, heat flow data
3. Geologic aspects of heat flow: convection currents within the Earth, rock metamorphism, and mountain building
4. Surface manifestations of heat flow: volcanoes, hot springs, geysers, and related phenomena

E. The mechanical properties of the Earth

1. The fundamental mechanical properties of the Earth's body and the indirect evidence used to determine them
2. Nature of deformable media: stress and strain, models of the stress-strain behaviour of materials, seismic waves
[see also 126.D.]
3. The basic internal mechanical properties of the Earth
4. The Earth's departures from spherical symmetry: oblateness, lateral variations associated with crustal structure, isostasy and its effects
[see also 211.A.2.b.]
5. Anelasticity in the Earth
6. Response of the Earth to stresses of long duration

F. Physical properties of Earth materials

1. Volumetric properties: rock density and porosity
2. Mechanical properties
[see also 126.D., E., and G.]
3. Thermal properties: specific heat and thermal conductivity, thermal expansion and rock melting
4. Magnetic and electrical properties
[see also C.2., above]
5. Hydraulic properties: porosity and permeability, the capacity to store and transmit fluids
6. Optical properties: colour, lustre

G. The deformation of materials in the Earth's crust

1. Stress and strain of rocks
 - a. Response to stress
 - b. Elastic and plastic deformation
2. Folding of rocks
 - a. Tectonic folding
 - b. Foliation, lineation
 - c. Nappes (large rock sheets thrust over other rock formations)
 - d. Salt domes and other diapiric structures
[see also 724.B.1.b.]
 - e. Nontectonic folding; *e.g.*, slumping of recently deposited sediments
3. Fracture in rocks: joints, faults
4. Structural interference: the superposition of strains produced by the tectonic events of different ages
5. The deformation of ice in sheets and glaciers
[see also 222.A.3.a.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the Earth's physical properties

Earth, The: Its Properties, Composition, and Structure
Minerals and Rocks
Volcanism

MICROPAEDIA: Selected entries of reference information

General subjects

continental drift	dynamo theory	Earth tide	fault
dipolar hypothesis	Earth	earthquake	fold

geosyncline
gravitation
isostasy
orogeny

plate tectonics
polar wandering
remanent
magnetism

seafloor spreading
hypothesis
telluric current
volcanism

Biographies

See Section 10/33 of Part Ten

INDEX: See entries under all of the terms above

Section 213. The Structure and Composition of the Earth's Interior

A. The Earth's concentric layers

1. Physical properties and zonal structure of the Earth
[see also 212]
2. The basic divisions of the solid Earth
 - a. The crust: the Earth's outer layer, which is differentiated into continental and oceanic crust
 - b. The Mohorovičić discontinuity: the zone that separates crust from mantle
 - c. The mantle: the layer between crust and core that comprises the bulk of the Earth's volume
 - d. The core: the Earth's innermost region, thought to be molten liquid except for a solid inner portion
3. The development of the Earth's structure and composition
[see 241.A.]

B. Earthquakes: sources of seismic waves within the Earth

1. Causes of earthquakes
2. Distribution of earthquakes
3. Magnitude, motion, and energy of earthquakes
[see also 126.D. and 128.A.]
4. Seismic measurements and their interpretation
[see also 723.F.6.]

C. Distribution of elements in the Earth's core, mantle, and crust [see 214.C.]

D. The indirect geophysical and geochemical evidence used to infer the structure and composition of the Earth's interior

1. Geophysical evidence, mainly from earthquake analyses
[see also 212.E.]
 - a. Seismic wave velocities
 - b. Density distribution
2. Geochemical evidence
 - a. Investigations of geochemical equilibria at high temperatures and pressures: phase transitions in the Earth's interior
 - b. The composition and mineralogy of meteorites that may correspond to rocks forming the Earth's interior
 - c. Evidence from crustal igneous rocks that are derived from the upper mantle; *e.g.*, andesite lava flows, peridotite and eclogite inclusions in lava flows and some igneous rocks

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the structure and composition of the Earth's interior
Earth, The: Its Properties, Composition, and Structure
Earthquakes

MICROPAEDIA: Selected entries of reference information

General subjects

Earth
 earthquake
 Richter scale
 seismic belt
 seismic wave

Biographies

See Section 10/33 of Part Ten

INDEX: See entries under all of the terms above

Section 214. The Earth's Constituent Minerals and Rocks**A. The mineral constituents of the Earth**

1. The chemical composition, internal structure, and morphology of minerals
2. The physical properties of minerals: cleavage; hardness; tenacity; specific gravity; magnetic, optical, and radioactive properties
3. Classification of minerals in terms of crystal structure and chemical composition

a. The principal nonsilicate minerals

- i. Native elements
- ii. Sulfides and sulfarsenides
- iii. Sulfosalts
- iv. Oxides and hydroxides
- v. Halides
- vi. Carbonates
- vii. Nitrates and iodates
- viii. Borates
- ix. Sulfates
- x. Phosphates, arsenates, and vanadates
- xi. Molybdates, tungstates, and chromates

b. The silicate minerals

- i. Silicate structure and composition: the basic structural unit, the silicon-oxygen tetrahedron
- ii. Isolated and double tetrahedral group silicates
- iii. Ring silicates
- iv. Chain silicates
- v. Sheet silicates
- vi. Framework silicates

4. The occurrence of minerals in nature**a. The major rock-forming mineral groups**

- i. The olivines; *e.g.*, forsterite, fayalite
- ii. The pyroxenes; *e.g.*, augite, jadeite
- iii. The amphiboles; *e.g.*, hornblende, actinolite
- iv. The micas; *e.g.*, muscovite, biotite
- v. The feldspars; *e.g.*, orthoclase, albite
- vi. The feldspathoids; *e.g.*, nepheline, leucite
- vii. The silica minerals; *e.g.*, quartz, tridymite
- viii. The clay minerals; *e.g.*, kaolinite, illite

- ix. The carbonates; *e.g.*, calcite, dolomite
[see A.3.a.vi., above]
 - x. The garnets; *e.g.*, almandine, pyrope
 - xi. Other major rock-forming minerals; *e.g.*, magnetite, pyrite
 - b. The occurrence of mineral associations and phase equilibrium
 - i. In igneous and metamorphic rocks
 - ii. In sedimentary rocks and precipitates
 - iii. In the Moon, planets, and meteorites
[see also 133.C., 133.E.6.]
 - c. Ore deposits: concentrations of metals and metalliferous minerals
[see also 724.C.3.]
 - d. Minerals of gem quality
- B. Rocks and other constituents of the Earth's crust
- 1. Igneous rocks
 - a. Properties of igneous rocks: composition, texture, and structure
 - b. Classification of igneous rocks
 - c. Formation of igneous rocks: magmas
[see also 212.D.4.]
 - d. Distribution and abundance of igneous rocks
 - e. Principal families of igneous rocks
 - i. The intrusive igneous rocks that result when magma cools and solidifies below the surface of the Earth; *e.g.*, granite, gabbro, diorite
 - ii. The extrusive igneous rocks that form from magma that erupts at the surface of the Earth; *e.g.*, basalt, rhyolite, andesite
 - iii. The pyroclastic igneous rocks that form from deposits of explosive volcanic eruptions; *e.g.*, pumice, tuff, scoria
 - 2. Sedimentary rocks
 - a. Properties of sedimentary rocks: texture and mineralogical and geochemical composition
 - b. Classification systems: clastic, nonclastic
 - c. Sedimentary structures
 - d. Sedimentary environments: marine, nonmarine
 - e. Principal types of sedimentary rocks
 - i. Conglomerates, breccias, and other heterogeneous clastic rocks (*e.g.*, tillites)
 - ii. Sandstones: arenites and wackes
 - iii. Mudrocks, including shales
 - iv. Limestones and dolomites
 - v. Siliceous rocks
 - vi. Phosphorites
 - vii. Evaporites
[see also 724.B.1.b.]
 - viii. Iron-rich sedimentary rocks
 - ix. Organic-rich sedimentary rocks
[see 5., below]
 - f. Distribution of sedimentary rocks through time
 - 3. Metamorphic rocks
 - a. Metamorphic variables: temperature, pressure, and rock composition
 - b. Textural and structural features
 - c. Origin of metamorphic rocks

- d. Rocks of the principal facies
- e. Distribution of metamorphic rocks
- 4. The rock associations formed in different environments of the Earth's crust
 - a. In the oceanic regions: basaltic lavas, reef limestones, abyssal sediments of the deep oceans
 - b. In the stable continental regions: conglomerates, sandstones, evaporites, coal measures
 - c. In the continental borderlands: sandstones, shales, limestones
 - d. In the island arcs: andesite and spilite lavas, ultrabasic intrusive rocks, graywackes, shales
 - e. In the major mountain ranges: regionally metamorphosed rocks, granitic batholiths, early-stage basalts and peridotites, late-stage andesite lavas
 - f. In the piedmont regions that are adjacent to mountain ranges: gabbros, basalts, arkoses
- 5. Fossil fuels
 - a. Coals
[see also 724.B.1.b. and C.2.]
 - b. Petroleum
[see also 122.G.1.a. and 724.B.2. and C.1.]
 - c. Tar sands and oil shales
[see also 724.B.2. and C.1.]
 - d. Natural gas
[see also 122.G.1.a. and 724.B.2.]
- C. Occurrence of the elements in the Earth and its envelope
[see also 121.D.1.]
 - 1. Core
 - 2. Mantle (depleted and undepleted)
 - 3. Crust: igneous, sedimentary, and metamorphic rocks; soils
 - 4. Hydrosphere
[see 222.B. and C.]
 - 5. Atmosphere
[see 221.A.]
 - 6. Biosphere: selective concentration of elements by plants and animals
 - 7. The geochemical cycle: the primary geochemical differentiation of the Earth; the migration of elements throughout the atmosphere, hydrosphere, and solid Earth

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the Earth's constituent minerals and rocks

Chemical Elements
 Earth, The: Its Properties, Composition, and Structure
 Fuels, Fossil
 Minerals and Rocks
 Volcanism

MICROPAEDIA: Selected entries of reference information

General subjects

<i>borate minerals:</i>	malachite	analcime	nepheline
borate mineral	nahcolite	anorthite	orthoclase
borax	rhodochrosite	aventurine	peristerite
ulexite	siderite	celsian	perthite
<i>carbonate minerals:</i>	<i>feldspar and</i>	feldspar	plagioclase
aragonite	<i>feldspathoid</i>	feldspathoid	sanidine
bastnaesite	<i>minerals:</i>	labradorite	scapolite
calcite	adularia	leucite	sodalite
carbonate mineral	albite	microcline	wairakite
magnesite	alkali feldspar	micropegmatite	

halide minerals:

calomel
cerargyrite
fluorite
halide mineral
halite

igneous rocks and formations:

acid and basic rocks
amygdule
andesite
anorthosite
aplite
basalt
basanite
batholith
dacite
diabase
dike
diorite
dunite
felsic rock
gabbro
granite
granodiorite
greisen
igneous rock
kimberlite
laccolith
lamprophyre
latite
leucitite
mafic rock
magma
monzonite
myrmekite
nephelinesyenite
nephelinite
obsidian
pegmatite
peridotite
perlite
phonolite
picrite
pitchstone
pumice
pyroxenite
rhyolite
roof pendant
sill
spilite
syenite
tachylyte
teschenite
trachyte
tuff
volcanic glass
xenolith

metamorphic rocks and their formation:
amphibolite facies
anatexis
cataclastite

charnockite
eclogite
epidote-amphibolite facies
glaucophane schist facies
gneiss
granitization
granulite facies
greenschist facies
hornfels facies
induration
marble
metamorphic rock
metamorphism
metatexis
migmatite
phyllite
sanidinite facies
schist
skarn
slate
zeolitic facies

mineral fuels and deposits:

anthracite
asphalt
asphaltite
bitumen
bituminous coal
brown coal
cannel coal
coal
crude oil
gas reservoir
lignite
maceral
natural gas
oil shale
ozokerite
peat
petroleum
petroleum trap
pitch lake
pyrobitumen
shale oil
subbituminous coal
tar sand
wet gas

molybdate and tungstate minerals:

molybdate and tungstate minerals
scheelite
wolframite
wulfenite

native elements:

diamond
electrum
graphite

industrial diamond
native element
oxide and hydroxide minerals:

anatase
bauxite
boehmite
cassiterite
chromite
chrysoberyl
columbite
corundum
cuprite
emery
gibbsite
goethite
gossan
hematite
ilmenite
limonite
magnetite
oxide mineral

pitchblende
pyrochlore
pyrolusite
ruby

ruby spinel
rutile
sapphire
spinel
thorianite
uraninite

phosphate minerals:

amblygonite
apatite
arsenate mineral
carnotite
descloizite
erythrite
fluorapatite
lazulite
mimetite
phosphate mineral
pyromorphite
scorodite
triphylite
turquoise
vanadate mineral
variscite

sedimentary rocks and their formation:

arkose
banded-iron formation
black shale
breccia
cementation
conglomerate
diagenesis
diatomaceous earth
dolomite
evaporite
flysch

geode
gravel
graywacke
h lleflinta
limestone
lithification
loess
lutite
marl
molasse
nodule
o lite
phosphorite
porcellanite
quartzite
sand
sandstone
sedimentary facies
sedimentary rock
shale
siliceous rock
silt
siltstone
stratification
stylolite
subgraywacke
tillite

silica minerals:

agate
amethyst
aventurine
carnelian
chalcedony
chert and flint
chrysotile
citrine
coesite
cristobalite
fulgurite
jasper
lechatelierite
moss agate
onyx
opal
phillipsite
quartz
rock crystal
rose quartz
sard and sardonyx
sepiolite
serpentine
silica
silica mineral
smoky quartz
tridymite

silicate minerals:

actinolite
aegirine
almandine
amphibole
andalusite
andradite
augite
beryl

biotite	pyroxene	stibnite	hydraulic
chlorite	rhodonite	sulfide mineral	equivalence
chrysotile	riebeckite	sulfosalt	hydrothermal ore
clay mineral	serpentine	tetrahedrite	deposit
cordierite	silicate mineral	<i>zeolite minerals:</i>	iridescence
diopside	staurolite	apophyllite	kaolin
emerald	talc	chabazite	lapis lazuli
enstatite	topaz	clinoptilolite	lustre
epidote	tourmaline	epistilbite	metalogenic
forsterite-fayalite	vermiculite	erionite	province
series	vesuvianite	faujasite	metasomatic
garnet	wollastonite	heulandite	replacement
glaucosite	zircon	laumontite	mineral
glaucophane	zoisite	mordenite	Mohs hardness
grossular	<i>sulfate minerals:</i>	natrolite	nitrate and iodate
hornblende	alunite	zeolite	minerals
humite	anhydrite	<i>other:</i>	nuée ardente
jadeite	barite	accessory mineral	ore
kaolinite	celestite	amphibolite	paragenesis
kyanite	gypsum	bentonite	phase diagram
lepidolite	halotrichite	chromate mineral	phase rule
melillite	sulfate mineral	clay mineralogy	placer deposit
mica	<i>sulfide minerals:</i>	cleavage	pleochroic halo
monticellite	antimonide	colour index	polymorphism
montmorillonite	argentite	crocoite	primary mineral
muscovite	arsenide	devitrification	pseudomorph
nephrite	arsenopyrite	Eh-pH diagram	pyroelectricity
olivine	galena	filter-pressing	Riecke's principle
orthopyroxene	marcasite	foliation	rock
peridot	orpiment	fracture	sinter
phenakite	pyrite	fuller's earth	streak
phlogopite	pyrrhotite	gemstone	vein
pyrophyllite	sphalerite	grade scale	

INDEX: See entries under all of the terms above

Division II. The Earth's Envelope: Its Atmosphere and Hydrosphere

[For Part Two headnote see page 65.]

The outlines in the three sections of Division II treat the Earth's atmosphere, its hydrosphere, and weather and climate.

Section 221. The Atmosphere 73

222. The Hydrosphere: the Oceans, Freshwater Bodies, and Ice Masses 75

223. Weather and Climate 77

Section 221. The Atmosphere

A. The composition, structure, and features of the atmosphere

[see also 241.B. and 723.G.5.]

1. Division of the atmosphere by composition

a. The homosphere

i. Water cycle

[see also 222.D.3. and 223.A.1.]

ii. Carbon budget

iii. Nitrogen budget

iv. Sulfur budget

b. The heterosphere

i. Oxygen dissociation

- ii. Escape of helium and hydrogen from the upper atmosphere
- 2. Thermal structure
 - a. The troposphere
 - b. The stratosphere
 - c. The mesosphere
 - d. The thermosphere
- 3. Regions and phenomena of the upper atmosphere
 - a. The ozonosphere
 - i. Absorption of ultraviolet radiation of wavelengths harmful to plant and animal life
 - ii. Heating of the upper atmosphere
 - b. The ionosphere
 - i. Ionospheric variations and disturbances of atmospheric origin
 - ii. Ionospheric variations and disturbances of solar origin: auroras and magnetic storms
[see also 212.B.]
 - iii. The effects of the ionosphere on radio waves
[see also 735.I.5.]
 - c. The exosphere
 - i. Effects of low particle density on the properties of the exosphere
 - ii. Determination of the critical zone, the layer above which the number of particle collisions is negligible
 - iii. The Van Allen radiation belts
[see also 133.B. and 212.B.]
- B. The large-scale motions of the atmosphere
[see also 223]
 - 1. The general nature and relative scales of atmospheric motions: the resolution of winds into zonal (east-west), meridional (north-south), and vertical components
 - 2. The relation of wind to pressure and temperature: the cause of winds, the effect of Coriolis force, idealized winds derived from simplified models—the geostrophic and thermal winds
[see also 211.A.2.a.]
 - 3. Jet streams
 - 4. The westerlies of the mid-latitudes
 - a. Standing waves of the mid-latitude westerlies and related systems
 - b. Mid-latitude traveling disturbances: cyclones, anticyclones
[see 223.B.1.]
 - 5. Tropical wind systems
 - a. Trade winds
 - b. Tropical disturbances: noncyclonic storms, hurricanes and typhoons
[see 223.B.4.]
 - c. Monsoons
 - 6. Stratospheric and mesospheric wind systems
 - a. Polar-night westerlies
 - b. Summer easterlies of the mesosphere and stratosphere
 - 7. The mean meridional circulations of the atmosphere
 - 8. The driving mechanism of the atmosphere: the energy balance and the transport of heat and momentum

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major article dealing with the atmosphere
Atmosphere

MICROPAEDIA: Selected entries of reference information

General subjects

<i>atmospheric motion</i>	Siberian	exosphere	greenhouse effect
<i>and disturbances:</i>	anticyclone	F region	lapse rate
anticyclone	thunderstorm	ionosphere	magnetic storm
atmospheric	tricellular theory	magnetosphere	solar wind
circulation	tropical cyclone	mesosphere	temperature
atmospheric	updraft and	ozonosphere	inversion
turbulence	downdraft	protonosphere	whistler
cyclone	wind	stratosphere	
cyclostrophic	<i>atmospheric optical</i>	thermosphere	
wind	<i>phenomena:</i>	troposphere	
doldrums	airglow	Van Allen	
eddy	atmospheric	radiation belt	
Ferrel cell	corona	<i>other:</i>	
geostrophic motion	aureole	air	
gradient wind	aurora	air mass	
Hadley cell	halo	atmosphere	
jet stream	<i>regions and zones of</i>	atmospheric	
monsoon	<i>the atmosphere:</i>	pressure	
polar anticyclone	D region		
Rossby wave	E region		

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INDEX: See entries under all of the terms above

Section 222. The Hydrosphere: the Oceans, Freshwater Bodies, and Ice Masses
A. The distribution of water in the hydrosphere
1. Saltwater bodies

a. Oceans and marginal seas

b. Gulfs and bays

2. Freshwater bodies

a. Rivers, lakes, and marginal bodies such as estuaries and swamps

[see 232.C.1., 2., and 3.]

b. Groundwater contained within the pores of rocks

3. Ice

a. Ice sheets and glaciers

[see also 212.G.5. and 232.C.6.]

b. Icebergs and pack ice

c. River ice and lake ice

4. Water in the biosphere

[see 351]

B. The physical and chemical properties of seawater

[see also 241.C.]

C. The physical and chemical properties of freshwater
D. The hydrologic cycle

1. The general nature of the hydrologic cycle: the types of processes involved and their complex interaction, scales of magnitude of the interrelated components of the global hydrologic system, influences of climate and other factors

2. The roles of evaporation and transpiration in the hydrologic cycle
[see also 336.B.4.]
 3. The role of water vapour in the hydrologic cycle: condensation, precipitation
[see also 223.A. and E.1.e.]
 4. Runoff and subsurface water in the hydrologic cycle
[see also 232.A.4.]
 5. The role of ice in the hydrologic cycle
[see also A.3., above]
 6. Water resources and supply
[see also 737.A.1.]
- E. Ocean-atmosphere interactions
1. Radiation, heat, and water budgets
 2. Oceanic waters as an important sink for carbon dioxide
 3. Impact of ocean-atmosphere interactions on climate and weather
 - a. Link between ocean surface temperature and climate anomalies
 - b. El Niño/Southern Oscillation (ENSO)
 - c. Moderating effects of the Gulf Stream system on climate
- F. Effects of human activities on the hydrosphere; *e.g.*, cultural eutrophication; acidification of precipitation resulting from the emission of sulfur dioxide and nitrogen oxides; potential disruption of the water balance due to greenhouse warming induced by carbon dioxide buildup
- G. Waves in the hydrosphere
[see also 126.F., 128.A., and 232]
1. Surface waves: simple waves, ocean waves, tsunamis
 2. Internal waves
 3. Tides
[see also 133.E.7.c.]
- H. Ocean currents
1. The distribution of ocean currents
 2. The forces that cause and affect ocean currents: pressure gradients, Coriolis force, frictional forces
[see also 211.A.2.a.]
 3. The general surface circulation
 4. Subsurface ocean currents
 - a. The general deep-sea circulation
 - b. Tidal currents: periodic currents associated with tides in the sea
 - c. Density currents down continental slopes, produced by differences in temperature, salinity, or sediment concentration
[see also 231.C.3.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the hydrosphere: the oceans, freshwater bodies, and ice masses

Earth, The: Its Properties, Composition, and Structure	Lakes
Hydrosphere, The	Oceans
Ice and Ice Formations	Rivers

MICROPAEDIA: Selected entries of reference information

General subjects

<i>freshwater resources:</i>	groundwater	lake	river
aquifer	ice	reservoir	spring

water resource	<i>motions of the sea:</i>	<i>ocean zones:</i>	<i>other:</i>
well	density current	bottom water	acid rain
<i>ice masses:</i>	ocean current	halocline	air-sea interface
firn	rip current	thermocline	bore
glacier	seiche	<i>saltwater bodies:</i>	eutrophication
ice formation	tide	bay	fetch
ice shelf	tsunami	estuary	greenhouse effect
iceberg	undertow	gulf	hydrologic cycle
pack ice	wave	lagoon	hydrosphere
permafrost	whirlpool	ocean	sea level
polynya			water mass

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See Section 10/33 of Part Ten

INDEX: See entries under all of the terms above

Section 223. Weather and Climate

- A. Condensation of water in the atmosphere producing clouds, fogs, and precipitation
 1. Moisture in the atmosphere
[see also 221.A.1.a. and 723.G.5.]
 - a. Humidity indices: absolute, specific, and relative humidity; dew-point temperature
 - b. Climatic aspects of atmospheric humidity
[see E.1.e., below]
 - c. Effects of atmospheric humidity on the life and health of humans and other life-forms
[see E.4., below]
 2. Condensation of atmospheric water vapour
 - a. Convection, air-mass convergence, and other processes that lead to condensation
[see also 221.B.]
 - b. Condensation nuclei: atmospheric ions, salt and dust particles
 - c. Dew
 - d. Frost
 3. Clouds and fogs
 - a. Formation and growth of clouds
 - b. Description and classification of clouds
 - c. Clouds and weather
 - d. Fog
 - e. Artificial modification of clouds and fogs
 4. Precipitation
[see also 222.D. and 723.G.5.]
 - a. Origin of precipitation in clouds, mechanisms of precipitation release
[see also A.3.a., above]
 - b. Types of precipitation: drizzle, rain, freezing rain; snow; sleet, hail
 - c. The world distribution of rainfall
 - d. Effects of precipitation
- B. Winds and storms
[see also 221.B.]
 1. Development and distribution of cyclones and anticyclones
 2. Lightning and thunderstorms
[see also 127.A. and B.]
 3. Tornadoes, hail, and other severe phenomena associated with organized storms or squall lines
 4. Tropical cyclones: hurricanes and typhoons

C. Weather forecasting

1. Synoptic weather data: the collection and correlation of meteorological observations
2. Numerical weather prediction and numerical climate modeling
3. Short-range forecasting
 - a. Nowcasting: predictions based on computer analyses of radar and satellite observations of local atmospheric conditions
 - b. Model Output Statistics: extrapolation of weather conditions, using statistical relations between numerical model forecasts and past weather phenomena
4. Long-range forecasting
 - a. Enhancing the reliability of extended-range prediction through systematic studies of atmosphere-ocean interactions; *e.g.*, El Niño/Southern Oscillation (ENSO)
 - b. Limits to predictability

D. Weather lore

E. Climate: the aggregate of weather

[see also 133.B.5., 221, and 723.G.5.]

1. Factors that generate climate

- a. Solar radiation
 - i. Variability of incident radiation; the solar constant
 - ii. Effects of the atmosphere: absorption by dust and gases, including the trapping of solar radiation of infrared wavelength (the so-called greenhouse effect)
 - iii. Variations in the Earth's albedo due to clouds and ice

b. Temperature

c. Atmospheric pressure

d. The world's oceans

e. The moisture cycle

2. Climatic variation

- a. Seasonal changes resulting from the north-south migration of belts of cyclonic activity and other cyclic processes
- b. Local effects: modification of climate by local terrain and surface conditions
- c. Effects of human activities on global climate; *e.g.*, greenhouse warming induced by high concentrations of carbon dioxide (from the burning of fossil fuels) and other trace gases in the atmosphere
[see also 241.B.5. and 737.C.1.]

3. Climatic types: the Köppen classification system, world climates and their distribution

4. Influences of climate on terrestrial life

5. Microclimates

[see also 351.B.]

6. Climatic change

- a. Evidence: *e.g.*, landscape features associated with glaciations; fluctuations of lake and sea levels; pollen stratigraphy; archaeological and historical data
- b. Identified causes of certain forms of climatic variation: variations in the tilt of the Earth's axis and orbital motion; variations in atmospheric composition; volcanic dust loading of the atmosphere; and changes in the distribution of land and sea due to plate-tectonic activity

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major article dealing with weather and climate

Climate and Weather

MICROPAEDIA: Selected entries of reference information

General subjects

<i>atmospheric humidity and precipitation:</i>	cyclostrophic wind	<i>climate and climatic variation:</i>	windchill
aerosol	etesian wind	autumn	World Weather Watch
cloud	foehn	climate	<i>weather disturbances and related phenomena:</i>
condensation	geostrophic motion	drought	atmospheric
nucleus	gradient wind	Indian summer	turbulence
dew	gregale	microclimate	blizzard
fog	haboob	pluvial regime	lightning
frost	Hadley cell	season	storm
hail	harmattan	snow line	thunder
hoarfrost	horse latitude	spring	thunderstorm
humidity	jet stream	summer	tornado
precipitation	katabatic wind	timberline	tropical cyclone
rain	khamisin	urban climate	<i>weather lore:</i>
rime	lee wave	winter	Groundhog Day
snow	levanter	<i>meteorological measurement and weather forecasting:</i>	Saint Swithin's Day
<i>atmospheric pressure and wind:</i>	microburst	Beaufort scale	<i>other:</i>
anticyclone	mistral	hygrometer	almanac
atmospheric	monsoon	isentropic chart	El Niño
circulation	polar anticyclone	isobar	front
atmospheric	Siberian	isotherm	greenhouse effect
pressure	anticyclone	psychrometer	smog
bora	sirocco	temperature–	sunlight
breeze	subtropical high	humidity index	weather
Buy's Ballot's law	surge	weather bureau	weather
convergence and	tricellular theory	weather forecasting	modification
divergence	updraft and	weather map	
cyclone	downdraft		
	wind		

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Division III. The Earth's Surface Features

[For Part Two headnote see page 65.]

The outlines in the two sections of Division III deal with the basic physical features of the Earth's surface and with the features produced by geomorphic processes acting on the Earth's surface.

Section 231. Physical Features of the Earth's Surface 79

232. Features Produced by Geomorphic Processes Acting on the Earth's Surface 81

Section 231. Physical Features of the Earth's Surface

A. Vertical relief of the Earth's surface

1. Hypsography of the Earth's surface: distribution of land and sea, elevation of the continents, coastlines
2. Physiography of the continents: Europe, Asia, Africa, Australia, North America, South America, Antarctica
3. The oceanic regions
 - a. Principal oceanic features: continental margins, oceanic ridges, deep-sea trenches, and abyssal hills and plains
[see C., D., and G., below, and 723.G.3.]

- b. Oceanic physiography
- B. The stable platform regions of the continents
 - 1. The continental shield areas and their age, structure, and constituent rocks
[see also 214.B.4.b.]
 - 2. Uplift, downward, and fracture of continental platforms
 - a. Plateaus and basins
 - b. Rift valleys
 - c. Water bodies occupying fault-bounded structural depressions: lakes and landlocked seas; inland seas with outlets to the oceans; elongated seas formed by crustal separation
- C. The continental shelf, slope, and rise
 - 1. Composition: evidence from bottom samples, geophysical techniques
 - 2. Structure and origin
 - 3. Submarine canyons incising the continental terrace
- D. The oceanic deeps
 - 1. Components of ocean basins
 - a. The oceanic crust
 - b. Major features of the deep-ocean floor: oceanic ridges, aseismic ridges, trenches, fracture zones, and transform faults; seamounts and guyots; abyssal hills and plains; sediments of the ocean floor
[see also G., below]
 - 2. The origin of ocean basins
[see also 241.F.]
- E. Coral islands, coral reefs, and atolls
[see also 354.B.2.]
- F. The major mountain ranges and fracture zones of the Earth's crust on the continents and beneath the oceans
 - 1. Types of mountains; *e.g.*, volcanic, block-fault, folded
 - 2. The worldwide system of mountain ranges, fracture zones, and volcanic island arcs
 - a. The Circum-Pacific System
 - b. The Tethyan System
 - c. Subsidiary mountain ranges
 - d. The volcanic island arc systems
 - e. The rock types constituting the folded mountain ranges and island arcs
[see 212.G. and 214.B.4.]
- G. Oceanic ridges
 - 1. Classification of ridges
 - a. The global oceanic ridge system: spreading-centre zones and associated phenomena
 - b. Aseismic ridges
 - 2. Origin and growth of ridges
 - a. General geophysical properties
 - b. Oceanic ridges as manifestations of divergent lithospheric plate boundaries
[see also 241.F.]
 - 3. Occurrence and distribution of ridges in the Atlantic, Pacific, and Indian oceans

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the physical features of the Earth's surface

Continental Landforms
Earth, The: Its Properties,
Composition, and Structure

Oceans
Plate Tectonics
Volcanism

MICROPAEDIA: Selected entries of reference informationGeneral subjects

<i>continental shelf and slope:</i>	continental shield	volcanic dome	oceanic ridge
continental shelf	cuesta	volcano	oceanic trough
continental slope	dome	<i>oceanic structures and features:</i>	seamount
submarine canyon	drumlin	abyssal hill	submarine gap
submarine fan	esker	abyssal plain	<i>other:</i>
submarine slump	meteorite crater	archipelagic apron	continent
<i>landforms and surface features:</i>	mountain	atoll	density current
alluvial fan	pediment	cay	landform
basin	plain	coral reef	lake
beach	plateau	deep-sea trench	marine sediment
canyon	playa	guyot	ocean
cave	rift valley	island	ooze
cinder cone	saline flat	island arc	
	salt dome	oceanic plateau	
	sand dune		

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INDEX: See entries under all of the terms above

Section 232. Features Produced by Geomorphic Processes Acting on the Earth's Surface

- A. The action of the hydrosphere and atmosphere on the Earth's surface features
 1. The process of weathering: the disintegration and alteration of rocks at or near the Earth's surface
 2. Soil formation as a result of weathering
 - a. Processes and factors in soil formation
[see also 354.A.2.b.]
 - b. Classification and distribution of soils
 - c. Soil crusts
 - d. Soil erosion and deterioration
 3. Gravitational processes: earth movements on slopes
 4. Fluvial processes
[see also 126.F.3.]
 - a. Entrainment and transport of materials
 - b. Erosion, deposition
 - c. The sediment yield of drainage systems
 - d. The formation of hillslopes
 5. Eolian processes
 - a. Transportation of rock debris by wind
 - b. Effects of wind transport
 - c. Deposition by wind: formation and migration of dunes, the role of vegetation
 - d. Wind action and the works of humankind
 6. Marine processes
 - a. Erosion and deposition of coastal materials by waves and currents
 - b. Transport of sediment by density flows
 7. Glacial processes: erosion, transport, deposition, glacial loading and unloading, periglacial processes
[see also C.6., below]
 8. Lacustrine processes
 - a. Erosion and deposition by waves and currents

- b. Sedimentation in lakes
 - c. Effects of flora and fauna on lakes and lake systems
[see 354.B.3.a.]
- B. The actions of the biosphere, exosphere, and lithosphere upon the Earth's surface features
 - 1. Biological processes
[see also 351]
 - a. Effects of plants and organisms on rock weathering and soil formation
[see A.1. and A.2.a., above]
 - b. Effects of vegetation type and density on sediment yield
[see A.4.c., above]
 - c. Effects of humankind on the Earth's surface features; *e.g.*, land cultivation, mining, construction of artificial channels and dams
[see also 355, 731, 733.B., 734, 736, and 737]
 - 2. Extraterrestrial processes: the occurrence of meteorite craters
[see also 133.A.3.c.]
 - 3. Volcanic-tectonic processes
[see also 212.D.4., 212.G., 231.F., and 241.E.]
- C. The characteristic features of the Earth's major environments
 - 1. The fluvial environment
[see also 354.B.3.b.]
 - a. Distribution of rivers in nature
 - b. Drainage patterns
 - c. The geometry of river systems
 - d. Streamflow and fluvial landforms: peak discharge and flooding, river floodplains and terraces, river deltas, ephemeral streams, waterfalls
 - e. The evolution of river systems through geologic time
 - 2. The lacustrine environment
[see also 354.B.3.a.]
 - a. Lake basins
 - b. Lake hydraulics: lake currents, surface waves, seiches, effects of wave and current action
[see also 222.G.1.]
 - c. Lakes in arid regions
[see C.5., below]
 - d. Glacial lakes
[see C.6., below]
 - e. Swamps, marshes, and bogs
 - 3. The estuarine environment
 - a. The formation and destruction of estuaries
 - b. Hydrologic features of estuaries
 - 4. The marine environment
[see also 354.B.4.]
 - a. Coastal features resulting from depositional processes
 - i. Beaches: materials, morphological features, physical processes
 - ii. Sand dunes and sandbars
 - iii. River deltas
[see C.1.d., above]
 - iv. Coral reefs
[see 231.E.]
 - v. Lagoons
 - vi. Marshes
[see C.2.e., above]
 - b. Coastal features resulting from erosional processes: sea cliffs and related landforms

- c. Coastal features dependent on bedrock type, bedrock structure, or local topography: grottoes, spouting holes, fjords, peninsulas, islands
 - d. Submerged coastal features: the continental shelf and slope, submarine canyons
[see 231.C.]
 - 5. The desert environment
[see also 354.A.1.c.]
 - a. Geomorphic processes that shape desert landforms
 - b. Surficial features of deserts
 - i. Mountains, plateaus, pinnacles, and similar features
 - ii. Alluvial fans: fan-shaped sedimentary deposits bordering highlands from which the sediment was derived
 - iii. Pediments: bedrock surfaces fringing desert highlands
 - iv. Desert plains, basins, depressions
 - v. Playas, pans, saline flats
 - vi. Sand sheets and sand dunes
 - c. Desert boundaries: expansion and contraction of desert areas
[see also 223.E.6.]
 - 6. The glacial environment
[see also 354.A.1.d.]
 - a. Processes of glaciation
[see A.7., above]
 - b. Landforms produced by glacial erosion
 - i. Rock polish, striations, grooves, and other small-scale features
 - ii. Glaciated valleys, cirques, arêtes, horns, fjords
 - iii. Glacially eroded rock basins in non-mountainous regions
 - c. Landforms produced by glacial deposition
 - i. Glacial till, moraines, drumlins, and other landforms of nonstratified drift
 - ii. Ice-contact deposits, kames, eskers, and other landforms of stratified drift
 - iii. Glaciolacustrine sediments and associated landforms
 - d. Landforms produced by periglacial processes
 - i. Permafrost
 - ii. Talus, rock glaciers, block fields
 - iii. Patterned ground, including stone nets, stripes, and polygons, and features related to the melting of buried ice masses
 - 7. The polar environment
[see C.6., above, and 354.A.1.d.]
 - 8. The tropical environment: jungles, rain forests
[see also 354.A.1.c.]
 - 9. The temperate environment: woodlands and grasslands
[see also 354.A.1.c.]
 - 10. The subterranean environment: *e.g.*, caves and cave systems
[see also 354.A.1.d.]
 - 11. Karst topography
- D. Basic concepts in the theory of landform evolution
- 1. The concept of uniformitarianism
[see also 242.A.2.a.]
 - 2. The concept of the cycle of erosion
 - 3. The concept of morphogenetic regions
 - 4. The concept of dynamic equilibrium
 - 5. The concept of entropy
[see also 124.A.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the features produced by geomorphic processes acting on the Earth's surface

Continental Landforms	Lakes
Earth, The: Its Properties, Composition, and Structure	Oceans
Geomorphic Processes	Rivers
Ice and Ice Formations	Soils
	Volcanism

MICROPAEDIA: Selected entries of reference information

General subjects

<i>effects of fluvial processes:</i>	drumlin	<i>physiographic effects of eolian processes:</i>	geyser
alluvial fan	esker	barchan	hot spring
arroyo	estuary	desert varnish	lava cave
badland	fjord	playa	mud volcano
bajada	glacial stage	saline flat	volcanic dome
delta	glacial valley	sand dune	volcano
desert pavement	ice cave	seif	<i>other:</i>
drainage basin	kettle	<i>soil formation and major soil types:</i>	astrobleme
floodplain	moraine	alfisol	meteorite crater
fluvial process	moulin	aridisol	morphogenetic region
inselberg	outwash	chernozem	peneplain
meander	roche moutonnée	clay	permafrost
oxbow lake	till	entisol	pingo
river	<i>gravitational processes on hillslopes:</i>	histosol	polder
river terrace	avalanche	humus	residual landform
streambed	creep	inceptisol	thermokarst
valley	landslide	kaolisol	
waterfall	mass movement	laterite	
<i>effects of weathering:</i>	mudflow	mollisol	
calcrete	rock glacier	oxisol	
cave	<i>marine features produced by wave action:</i>	podzol	
duricrust	beach	podzolic soil	
exfoliation	beach cusp	soil	
ferricrete	chenier	spodosol	
pediment	lagoon	ultisol	
pepino hill	sandbar	vertisol	
sinkhole	sea cave	<i>volcanic structures and related phenomena:</i>	
weathering	wave-cut	cinder cone	
<i>glacial features and landforms:</i>	platform	fumarole	
chatter mark			
cirque			

Biographies

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Division IV. The Earth's History

[For Part Two headnote see page 65.]

The outlines in the three sections of Division IV deal with the origin and development of the Earth and its envelopes; the interpretation of the geologic record; and the eras and periods of geologic time.

Section 241. Origin and Development of the Earth and Its Envelopes 85

242. The Interpretation of the Geologic Record 86

243. The Eras and Periods of Geologic Time 88

Section 241. Origin and Development of the Earth and Its Envelopes**A. The origin and evolution of the lithosphere**

[see also 213.A.]

1. Theories of the origin of the Earth
2. The development of crust from mantle: processes involved in the geochemical differentiation of the Earth's outer layers

B. The origin and evolution of the atmosphere

[see also 221.A.]

1. The relation of the development of the Earth's atmosphere to the origin of the solar system and the development of other planetary atmospheres
2. The original atmosphere of the Earth
3. Development of the present terrestrial atmosphere
[see also 335.B.]
4. The present atmosphere
[see 221.A.]
5. Effects of human activities and their ramifications; *e.g.*, acid rain resulting from the emission of sulfur dioxide; ozone depletion caused by the release of chlorofluorocarbons; greenhouse warming induced by the buildup of carbon dioxide
[see also 223.E.2.c.]

C. The origin and evolution of the hydrosphere

1. The early oceans
2. The chemical view of the modern oceans
3. The present hydrosphere
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D. The formation and growth of the continents

1. The Earth's crust and upper mantle
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2. Endogenic regimes of the continents: geosynclines, platforms, rifts, continental margins
[see also 231]
3. The relation between endogenic regimes and deep-seated Earth processes

E. The formation and growth of mountain ranges and belts

1. The distribution of mountain belts in relation to global tectonics
2. The tectonic mountain belts
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3. The geosynclinal hypothesis of mountain building
4. The development of mountain systems

F. The theory of plate tectonics

1. Early speculations about the existence of a single supercontinent and its fragmentation into the present-day landmasses

2. Wegener's concept of continental drift
3. Hess' seafloor spreading model
4. Plate tectonics as a unifying theory
 - a. Lithospheric plate boundaries as sites of volcanism, seismicity, and orogeny
 - b. The impact of continental drift on the evolution of life-forms

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the origin and development of the Earth and its envelopes

Atmosphere
 Earth, The: Its Properties, Composition, and Structure
 Plate Tectonics
 Volcanism

MICROPAEDIA: Selected entries of reference information

General subjects

<i>atmosphere and hydrosphere:</i>	<i>landmasses and ocean basins:</i>	plate tectonics	orogeny
atmosphere	continental drift	seafloor spreading	sedimentation
Earth	Gondwanaland	hypothesis	subsidence
hydrosphere	Laurasia	<i>evolution of the Earth's crust:</i>	uplift
ocean	Pangaea	epeirogeny	volcanism
		erosion	weathering

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A. The stratigraphic interpretation of the geologic record

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 - a. Clastic sedimentary rocks
 - b. Carbonate rocks
 - c. Volcanic rocks
 - d. Cyclic deposits: cyclothems, varved deposits
2. Stratigraphic classifications and their historical development: criteria for the correlation of layered deposits
 - a. The principle of uniformitarianism
 - b. The principle of superposition of strata
 - c. The idea of a fossil succession
 - d. The facies concept
 - e. The stage concept
 - f. The recognition of zones
 - g. Radiometric dating
 [see D.2., below]
3. Stratigraphic nomenclature in theory and practice
 - a. Stratigraphic terminology and its standardization

- b. Stratigraphic boundary problems
 - c. Special stratigraphic terminologies and divisions
- B. The paleontological interpretation of the geologic record
 - 1. The nature of fossils and fossilization processes
 - 2. The fossil record
 - a. Precambrian life: the Proterozoic fossil record
 - i. The origin of life
[see 312.A.]
 - ii. Precambrian protists, plants, and animals: the Gunflint Chert deposits, Ediacara fauna, and other remains
 - b. Post-Precambrian life: the Phanerozoic fossil record
[see also 243 and 313]
 - i. Fossil plants
 - ii. Fossil protists
 - iii. Fossil sponges
 - iv. Fossil cnidarians (*e.g.*, corals)
 - v. Fossil mollusks (*e.g.*, ammonoids)
 - vi. Conodonts
 - vii. Bryozoans
 - viii. Brachiopods
 - ix. Fossil arthropods (*e.g.*, trilobites)
 - x. Fossil echinoderms (*e.g.*, sea lilies)
 - xi. Graptolites
 - xii. Fossil fish
 - xiii. Fossil amphibians
 - xiv. Dinosaurs and other fossil reptiles
 - xv. Fossil birds
 - xvi. Fossil mammals
 - 3. The appearance and disappearance (mass extinctions and background extinctions) of species revealed in the fossil record
[see also 312.B.]
 - 4. The paleontological criteria for the correlation of layered rocks
 - a. Index fossils
 - b. Faunal and floral assemblages
 - c. Organic microfossils: pollen, spores, tests
- C. Relative age dating
 - 1. Application to geologic problems: stratigraphic correlation and the relative geologic time scale
[see also 243]
 - 2. Application to archaeological problems
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- D. Absolute dating
 - 1. General considerations: the meaning of absolute age, requirements for absolute dating, the rate of record accumulation
 - 2. Radiometric dating
[see also 723.G.8.]
 - a. Radioactivity and radioactive decay
[see 112.C.]
 - b. Principles of radiometric dating

- c. Definition of time zero, sources of error in radiometric dating
 - d. Dating methods
- 3. Non-radiometric dating: biological and geologic processes as absolute chronometers
- 4. Applications of absolute dating
 - a. The absolute geologic time scale
 - b. Determination of the age of the Earth and the ages of rocks and meteorites
 - c. Determination of the rates of seafloor spreading
- E. The paleogeographical interpretation of the geologic record
- F. The reconstruction of the geologic history of the Earth based on the global correlation of the accumulated evidence from the rock record
[see 241 and 243]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the interpretation of the geologic record

Earth, The: Its Properties, Composition, and Structure

Geochronology: The Interpretation and Dating of the Geologic Record

MICROPAEDIA: Selected entries of reference information

General subjects

carbon-14 dating	helium dating	potassium-argon	uniformitarianism
dating	horizon	dating	uranium-thorium-
dendrochronology	index fossil	protactinium-231-	lead dating
Earth	ionium-thorium	thorium-230	varved deposit
faunal succession,	dating	dating	
law of	lead-210 dating	radiation-damage	
fission-track dating	paleogeography	dating	
fossil	polychaete	sedimentary facies	
geochronology	hypothesis	tephrochronology	

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- A. Precambrian time: from the time of formation of the oldest rocks to 540 million years ago
- B. The Paleozoic Era: from 540 to 245 million years ago
 - 1. The Cambrian Period
 - 2. The Ordovician Period
 - 3. The Silurian Period
 - 4. The Devonian Period
 - 5. The Carboniferous Period
 - 6. The Permian Period
- C. The Mesozoic Era: from 245 to 66.4 million years ago
 - 1. The Triassic Period
 - 2. The Jurassic Period
 - 3. The Cretaceous Period

D. The Cenozoic Era: from 66.4 million years ago to the present

1. The Tertiary Period

2. The Quaternary Period

[see also 411.C.]

a. The Pleistocene Epoch

[see also 223.E.6. and 232.C.6.]

b. The Holocene, or Recent, Epoch

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the eras and periods of geologic time

Earth, The: Its Properties, Composition, and Structure

Geochronology: The Interpretation and Dating of the Geologic Record

Volcanism

MICROPAEDIA: Selected entries of reference information

General subjects

<i>Cenozoic:</i>	Sub-Atlantic	Catskill Delta	Wenlock Series
Allerød	Climatic Interval	Chesterian Series	Williston Basin
Blytt-Sernander system	Sub-Boreal	Cincinnati Arch	<i>Precambrian:</i>
Boreal Climatic Interval	Climatic Interval	Cincinnatian Series	Animikie Series
Bronze Age	Tertiary Period	Coal Measures	Belt Series
Cenozoic Era	Trinil faunal zone	Conemaugh Series	Bitter Springs microfossils
Eocene Epoch	<i>Mesozoic:</i>	Dalradian Series	Bruce Series
Florissant Formation	Clarence Series	Devonian Period	Coutchiching Series
Great Drought	Coniacian Stage	Lipalian interval	Grand Canyon Series
Holocene Epoch	Cretaceous Period	Llandeilan Series	Gunflint microfossils
Hypsithermal Climatic Interval	Gulf Series	Llandovery Series	Katangan Complex
Iron Age	Hell Creek Formation	Llanvirn Series	Lewisian Complex
Laurentide Ice Sheet	Jurassic Period	Ludlow Series	Longmyndian
London Clay	Lance Formation	Mississippian Period	Onverwacht Series
Mauer	Mesozoic Era	Nashville Dome	Precambrian time
Mesolithic Period	Niobrara Limestone	Niagaran Series	Proterozoic Eon
Miocene Epoch	Pierre Shale	Old Red Sandstone	Seine Series
Neogene Period	Purbeck Beds	Ordovician Period	Sturtian Series
Neolithic Period	Solnhofen Limestone	Paleozoic Era	<i>other:</i>
Oligocene Epoch	Stormberg Series	Paradoxides Series	ice age
Paleocene Epoch	Taitai Series	Pennsylvanian Period	Phanerozoic Eon
Paleogene Period	Triassic Period	Permian Basin	
Paleolithic Period	<i>Paleozoic:</i>	Permian Period	
Pleistocene Epoch	Alberta Basin	Pottsville Series	
Pliocene Epoch	Arenig Series	Queenston Delta	
Quaternary Period	Ashgill Series	Salado Formation	
Salpausselkä ridges	Beaufort Series	Silurian Period	
Scandinavian Ice Sheet	Cambrian Period	Virgilian Series	
	Caradoc Series		
	Carboniferous Period		

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Introduction to Part Three: The Mysteries of Life

By René Dubos

We take for granted the existence of life on Earth. Yet, as far as we now know, life exists nowhere else in the solar system, its origin is still a mystery, and its effects on our planet have been little short of miraculous. Without life the surface of the Earth and its atmosphere would be very different from what they are now. We are both spectators and actors in a continuing performance where life is both author and producer, and for which the Earth serves as an ever-changing stage.

Cataclysms give us now and then a glimpse of what our planet would look like without life. In 1883, a series of stupendous volcanic eruptions destroyed two-thirds of Krakatoa Island in the Malay archipelago and covered what was left of it with a thick layer of lava. All living things were killed, not only on Krakatoa itself, but also on the neighbouring islands that were in the path of the tidal wave generated by the explosion and of the volcanic fallout. What had once been a luscious tropical forest suddenly became a gray and lifeless landscape, as desolate as the surface of the Moon.

Pictures taken of Krakatoa in the months following the disaster help us to realize that what we regard as the surface of the Earth is less a geological structure than a living mantle. Our planet would be drab and dusty, an insignificant object in space, if it were not for the myriad of living forms that have generated its atmosphere and its soil out of gases and rocks. In fact, the phrase "life on Earth" is somewhat misleading because the surface of the Earth as we experience it, with its entrancing diversity and colourful warmth, is literally a product of biological activities—a creation of life.

Krakatoa remained a desolate landscape for a long time after the 1883 volcanic explosion. But progressively the wind and the sea brought back to its sterilized surface a multiplicity of living things, some of which managed to establish a permanent foothold on the lava. Today, the island harbours once more a rich flora and fauna, not very different from that of the native forest of the Malay archipelago.

There is a paradox in the marvelous resiliency of nature. On the one hand, all individual forms of life are extremely delicate. And yet life itself has been capable of prevailing over brute physical forces for several billion years, and has generated immensely diversified ecosystems that have remained viable even under the most inhospitable conditions. Life probably emerged from inanimate matter, but it is now more powerful than inanimate matter.

All biological phenomena are of practical importance because they determine the characteristics of the Earth's surface and therefore affect the quality of human life. Men have always been concerned with the contributions that living things make to their immediate environment and to the global economy; they have wondered how the flora

and fauna become more or less stabilized under normal conditions, and manage to reestablish stable ecosystems after cataclysms; in our times they worry to what extent living things can be disturbed or eliminated by urbanization and industrialization without thereby threatening human welfare.

But the phrase "life on Earth" also raises other questions of a more philosophical character, questions that have been in the minds of humble, uneducated people even before they became the preoccupation of scholars. In the universe at large, lifelessness is the rule, life the puzzling exception. How do living things differ from inanimate matter? How did they originate? And can life be created *de novo*? Is man qualitatively different from the rest of the living world or merely a higher, or the highest, specimen in its evolution, the paragon of animals?

It is clear from the geological record that life has been at home on the Earth for immense periods of time. The types of fossils found in rock formations indicate that all major groups of animals and plants were already represented by recognizable ancestors some 400,000,000 years ago. Furthermore, microscopic structures closely related to the present forms of blue-green algae have been found in geologic formations that are even very much older—some 3,000,000,000 years old. Since these fossils of algae-like organisms have a complex cellular organization, it can be assumed that they had been preceded by simpler forms, and that the origin of life is more ancient than the oldest traces of it which have been detected. In fact, there is no way to know when life first appeared on Earth, because its earliest manifestations were certainly so minute, fragile, and undifferentiated that none of them have survived as fossils.

There is a peculiar fascination to the phrase "the origin of life" because it means different things to different men, and reaches into the deepest layers of their beliefs. For the religious man, it implies the mysteries of divine creation—whether expressed as biological species in their final forms, or as the potentialities posited by Aristotelian philosophers and medieval theologians. For the student of myths, it evokes Aphrodite emerging fully developed from the foam of the sea. The myth may have a factual basis if it is true, as it is commonly believed, that the cradle of life was to be found in the primitive oceans. For the modern scientist the phrase "origin of life" refers to the kind of chemical reactions that first generated complex organic molecules and assembled them in such a manner that they could duplicate themselves—thus converting inanimate matter into living substance.

Whatever the mystical or rational basis of a person's beliefs, there is a universal poetic quality in the thought that life once arose from matter, and has been perpetuating itself ever since. But the only real clue to the origin of life is

that all its forms—at least all the living things we know—have many physicochemical characteristics in common. In particular, they all transfer their hereditary endowment from one generation to the next through the agency of a peculiar kind of molecule known as nucleic acid, the now famous DNA. This uniformity of fundamental structure holds true irrespective of the size, shape, and complexity of the organism—whether it be microbe, plant, animal, or man. Indeed, the similarity in structure of the genetic apparatus throughout the living world is so perfect that it cannot possibly be a matter of chance. The conclusion seems inescapable that all the living forms that now exist have had a common origin.

The simplest hypothesis to account for the origin and evolution of life is that all biological phenomena are caused by the physicochemical forces that govern the inanimate world. Some scientists believe, indeed, that there is nothing very unusual in the emergence of a living molecule from matter. According to them, it is probable that life repeatedly emerged *de novo* on Earth and that it is still emerging today somewhere in the cosmos. By making the reasonable assumption that one of the living forms that appeared on Earth proved more vigorous than the others, it is easy to account for the single origin of all surviving species. If an entirely new genetic form of life were to appear today on Earth, it would have no chance of success, because it could not compete with the established form and all its variations.

The hypothesis that life is nothing more than a special manifestation of ordinary physicochemical forces has the merit of being economical of thought; in addition, it is supported by the fact that all biological phenomena go hand in hand with the kind of reactions observed in the inanimate world. But even if we grant that living phenomena always obey physicochemical laws, this does not constitute decisive evidence that life is merely an expression of these laws. Other theories are conceivable. One of them, rarely voiced because it is not scientifically fashionable, is that some unknown principle runs like a continuous thread through all living forms and governs the organizations of their physicochemical processes. The illustrious Danish physicist Niels Bohr, for example, suggested that “the very existence of life must be considered an elementary fact, just as in atomic physics the existence of a quantum of action has to be taken as a basic fact that cannot be derived from ordinary mechanical physics.”

Uncertainties concerning the fundamental nature of life and its origin would disappear if it were possible to generate at will self-reproducing molecules from inert material. Some experimental findings have recently been quoted as evidence of this possibility.

A fully developed virus, which had been naturally produced by a living organism, was separated into its component parts by chemical procedures. When these separate parts were tested for biological activity, they were found to be inert, that is, they were unable to multiply in a susceptible organism. This biological activity was restored, however, when the parts of the virus were chemically reassembled in the test tube under the proper conditions. Spectacular as this achievement is from the chemical point of view, it does not constitute—as has been claimed—the production of life *de novo*. Since the virus first had to be

produced by a living organism, and since its reassembled parts showed activity only when introduced into a living susceptible organism, all the biological machinery essential for its reproduction had to be provided by preexisting life.

In a completely unrelated kind of experiment, several complex molecules similar to those found in living things have been produced in the laboratory by exposing simple chemicals to the kind of radiation that probably existed in the primitive atmosphere. But this chemical feat does not constitute production of life *de novo* because the molecules so produced have not been assembled—*organized*—in a way enabling them to duplicate themselves and to develop. An organic molecule, however complex and similar to the kind found in living things, still belongs to the realm of inanimate matter if it cannot reproduce and evolve.

To become “living,” an assembly of biogenic molecules must contain the information needed for its further development and must be able to transmit this information to its progeny. Even in its simplest manifestations, life is historical; it embodies the past and carries instructions for the future.

More than a century ago, the French physiologist Claude Bernard gave a clear formulation of the now classical view that the earmark of a living thing is not the chemical composition of its parts but their organization. He wrote: “Admitting that vital phenomena rest upon physicochemical activities, which is the truth, the essence of the problem is not thereby cleared up; for it is no chance encounter of physico-chemical phenomena which constructs each being according to a preexisting plan, and produces the admirable subordination and the harmonious concert of organic activity.

“There is an arrangement in the living being, a kind of regulated activity, which must never be neglected, because it is in truth the most striking characteristic of living beings. . . .”

In this celebrated passage, Bernard used the word “arrangement” to denote the interdependence and integration of the structures and properties of any given living organism. But biological organization applies also to the ecological system of which the organism is a part. All living things, without exception, depend on other living things for their survival and development. Furthermore, the higher the organism is on the evolutionary scale, the more exacting is its dependence on a complex web of life.

One of the major trends of evolution has thus been the emergence of more and more complex ecosystems, exhibiting high degrees of integration. But, paradoxically, an opposite trend can also be detected as one ascends the evolutionary scale—namely, a trend toward freedom or at least toward increasing independence of the individual organism within the constraints of the ecosystem. Freedom becomes more and more apparent as one proceeds from the protoplasmic jelly of biological beginnings to warm-blooded animals roaming in the wild, and finally to man who modifies his environment according to his views of the future. In a real way, evolutionary development is associated with the gradual insertion of more and more freedom into matter and into individual lives.

In the *Outline of Knowledge*, Part Three, concerned with life on Earth, is placed between Parts Two and Four, concerned, respectively, with the Earth itself and

with human life. This positioning is reasonable enough, but one could read into it an assumption that reaches far deeper than the logical ordering of concepts and facts. The tacit assumption is that human life has emerged from the inanimate matter of the Earth through the same kind of evolutionary continuum that links all the other living forms in a great chain of being. In reality, however, the theory of evolution does not provide decisive evidence for this assumption. What is *known* of biological evolution applies only to the anatomical structures and physiological functions of organisms that have lived in the past or are living now. The successive steps from matter to life, and from life to consciousness, have not yet been shown to have taken place through the kind of mechanisms that account for the evolutionary changes of anatomical structures of physiological functions. There exists a continuum from one form of life to another, but extending this continuum to inanimate matter on the one hand, and to human consciousness on the other, is a matter of faith rather than of scientific knowledge.

Even the most cursory observation of nature reveals that all living forms are conditioned by environmental forces, and that reciprocally they shape the environment, thereby contributing to the triumph of life. But it must be realized that the word "life" encompasses different kinds of relations to nature. At its lowest level, "life" implies,

as mentioned above, the deterministic and blind chemical reactions through which an organism—simple or complex as it may be—transmits its distinctive characteristics to its descendants and reacts adaptively to its environment. At its highest, "life" involves man's consciousness and free will and refers to the deep reality of the world within and the affirmation of the individual self, irrespective of the external world.

There is no way at present to link these two extreme and apparently incompatible manifestations of life—biological determinism and human freedom. Yet both are real, and both have been immensely influential in giving the present characteristics to our planet.

The surface of the Earth reflects the activities of countless living things. Even though these operate chiefly through blind, deterministic mechanisms, life introduces on Earth a degree of order, organization, and diversity not found anywhere else in the cosmos, not even in the movement of the celestial bodies. Man emerged, not on the bare planet, but in this orderly and diversified biological world. As soon as he achieved his identity as *Homo sapiens*, he began to insert his free will into ecological determinism. For good or evil, he has now become the most powerful influence in changing the face of the globe. His conscious choices will determine not only his own fate, but also the fate of life on Earth.

Part Three. Life on Earth

Several points about the relations of Part Three to other parts should be noted. The separation of Part Three from Part One, on matter and energy, and from Part Two, on the Earth, reflects a traditional division of labour among the natural sciences. However, the separation is not rigid. The borderline disciplines of biophysics and biochemistry appear throughout Part Three, especially in Division II, concerned with the molecular basis of vital processes. The effects of the Earth's atmosphere and hydrosphere on living things are reflected throughout Part Three, especially in Division V, which is concerned with the biosphere and with ecosystems.

Some fundamental biological knowledge of humans is involved in the treatment throughout Part Three of what is common to all life and to all animals. And Section 355, the last section of Part Three, deals with mankind's place and activities in the biosphere. However, what is specific to human life, human health, and human behaviour is separately dealt with in Part Four, on human life.

The biological sciences have themselves been the object of historical and analytical studies. Such studies are dealt with in Section 10/34 in Part Ten, which treats the historical development of the biological sciences; the methodology, scope, and conceptual structure of biology as a whole; and the several component disciplines at the different levels of biological research.

The design and operation of observational and experimental instruments are important in the development of the biological sciences. Such scientific instrumentation is dealt with in Section 723 of Part Seven.

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Division I. The Nature and Diversity of Living Things

The outlines in the three sections of Division I deal with the nature, the origin and evolution, and the classification of living things.

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Section 311. Characteristics of Living Things

- A. The concept of life on Earth
 - 1. Properties of life
 - a. Order and form
 - b. Metabolism: catabolism and anabolism
 - c. Sensory reception
 - d. Reproduction, growth, and development
 - e. Interaction with the environment
 - 2. Levels of biotic organization
 - a. Molecular: polymers, carbohydrates, lipids, proteins, and nucleic acids
 - b. Cellular: procaryotic cells and eucaryotic cells
 - c. Organ: tissues, tissue systems, and the whole organism
 - d. Population: species and communities

B. Life beyond the Earth

1. The concept of extraterrestrial life and its chemistry
2. The significance of the search for life beyond Earth
3. Exobiological survey of the solar system: physical environments and biological prospects

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the characteristics of living things

Animals	Growth and Development, Biological
Bacteria and Other Monerans	Life
Behaviour, Animal	Metabolism
Biological Sciences, The	Mimicry
Biosphere, The	Photosynthesis
Cells: Their Structures and Functions	Plants
Coloration, Biological	Protists
Evolution, The Theory of	Reproduction and Reproductive Systems
Fungi	Sensory Reception
Genetics and Heredity, The Principles of	

MICROPAEDIA: Selected entries of reference information

General subjects

apoptosis	evolution	life	metabolism
cell	homeostasis	life cycle	

Biographies

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Section 312. The Origin of Life and the Evolution of Living Things**A. Stages in the emergence of life**

1. Hypotheses about the origin of life
2. Steps in the production of chemical precursors of life
 - a. Formation of the Earth's primitive reducing atmosphere
 - b. Production of simple organic molecules
 - c. Production of long-chain molecules consisting of repeating units
 - d. Origin of the genetic code
3. The earliest living systems
 - a. Evolution of enzymatic reaction chains
 - b. Origin of procaryotic and eucaryotic cells
 - c. Evolution of photosynthesis
4. The antiquity of life: evidence of biological activity in the geological record
[see also 242 and 243]

B. The theory of evolution

1. The history of evolutionary theory
 - a. Lamarck's contribution
 - b. Darwin's theory of natural selection
 - c. Mendel's theory of heredity
 - d. The synthetic theory of evolution
 - e. Molecular and genetic studies

2. The evidence for evolution
 - a. The fossil record of gradual change
 - b. Structural similarities (homologies) of different species
 - c. Vestiges of ancestral forms in embryonic development
 - d. Molecular clues to evolutionary history
- C. The process of evolution
 1. Genetic variation through gene or chromosomal mutation
 2. Changes in gene frequencies within a population through gene mutation, gene migration, and genetic drift
 3. Natural selection
 - a. Adaptation and fitness
 - b. Aspects of the process of natural selection; coloration; mimicry; polymorphism
 - c. Natural selection in the process of genetic change
 - d. Types of selection: stabilizing, directional, diversifying, sexual, and kin
- D. The origin of species and the process of speciation
 1. The distinctiveness of species
 2. The criterion of reproductive isolation
 3. The properties of species
 4. Modes of speciation (*e.g.*, geographic speciation, adaptive radiation, quantum speciation)
 5. Genetic differentiation during speciation
 6. Patterns and rates of species evolution
 - a. The topology (or configuration) of phylogenies
 - b. The rate of morphological change: gradual or punctuational evolution
 - c. Molecular evolution
 7. The relationship between species and other taxonomic categories: family, order, class, phylum

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and a biography dealing with the origin of life and the evolution of living things

Coloration, Biological
 Darwin
 Evolution, Human
 Evolution, The Theory of
 Mimicry

MICROPAEDIA: Selected entries of reference information

General subjects

adaptation	coloration	homology	orthogenesis
aggressive mimicry	concealing	Lamarckism	phylogeny
analogy	coloration	mimicry	polymorphism
auxochrome	Darwinism	mosaic evolution	selection
biopoiesis	dialectic	Müllerian mimicry	species
carotene	evolution	mutation	spontaneous
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1. Algae
2. Protozoans
3. Slime molds

D. Fungi**E. Plants**

1. Bryophytes
 - a. Mosses
 - b. Liverworts
 - c. Hornworts
2. Psilotophytes, or whisk ferns
3. Lycophytes (club mosses and allies)
4. Sphenophytes, or horsetails
5. Filicophytes, or ferns
 - a. Ophioglossopsids
 - b. Marattiopsids
 - c. Filicopsids
6. Conifers
7. Ginkgos
8. Cycads
9. Gnetophytes
10. Angiosperms (magnoliophytes), or flowering plants
 - a. Magnoliopsids, or dicots
 - b. Liliopsids, or monocots

F. Animals

1. Placozoans
2. Porifera, or sponges
 - a. Calcispongiaens
 - b. Hyalospongiaens
 - c. Demospongiaens
3. Mesozoans
 - a. Dicyemids
 - b. Orthonectids
4. Cnidarians, or coelenterates
 - a. Anthozoans (corals; sea anemones; sea fans and sea whips; sea pens and sea pansies)
 - b. Scyphozoans (jellyfish)
 - c. Hydrozoans (hydra)
 - d. Cubozoans (box jellyfishes)
5. Ctenophores, or comb jellies
6. Platyhelminthes, or flatworms
 - a. Turbellarians

- b. Monogeneans
- c. Aspidocotyleans
- d. Trematodes, or flukes
- e. Cestodes, or tapeworms
- 7. Nemerteans, or ribbon worms
- 8. Acanthocephalans, or spiny-headed worms
- 9. Aschelminthes
 - a. Rotifers, or wheel animacules
 - b. Gastrotrichs
 - c. Kinorhynchates
 - d. Nematodes, or roundworms
 - e. Nematomorphs, or horsehair worms
- 10. Priapulids
- 11. Annelid worms
 - a. Polychaetes, or marine worms
 - b. Oligochaetes, or terrestrial worms
 - c. Hirudineans, or leeches
- 12. Tardigrades, or water bears
- 13. Onychophorans, or velvet worms
- 14. Arthropods
 - a. Crustaceans
 - b. Uniramians (millipedes, centipedes, pauropods, symphylans, and insects)
 - c. Chelicerates (sea spiders, horseshoe crabs, and arachnids)
- 15. Mollusks
 - a. Tryblids, or neopilinids
 - b. Solenogastres, or narrow-footed gliders
 - c. Caudofoveatans, or mudmoles
 - d. Placophorans, or chitons
 - e. Pelecypods, or bivalves (clams, mussels, oysters, scallops, and cockles)
 - f. Scaphopods, or tusk shells
 - g. Gastropods (limpets, snails, and slugs)
 - h. Cephalopods (nautilus; cuttlefishes, squids, and octopuses)
- 16. Bryozoans, or moss animals
 - a. Phylactolaemates
 - b. Stenolaemates
 - c. Gymnolaemates
- 17. Phoronids, or horseshoe worms
- 18. Brachiopods, or lamp shells
 - a. Inarticulates
 - b. Articulates
- 19. Sipunculid worms, or peanutworms
- 20. Chaetognaths, or arrowworms
- 21. Echiurids, or spoonworms
- 22. Echinoderms
 - a. Crinozoans, or sea lilies
 - b. Echinozoans (sea urchins, heart urchins, and sand dollars; sea cucumbers)
 - c. Asterozoans (starfish, brittle stars, and sea daisies)

23. Hemichordates
 - a. Enteropneusts, or acorn worms
 - b. Pterobranchs
24. Pogonophors, or beardworms
25. Chordates
 - a. Tunicates (sea squirts, appendicularians, and thaliaceans)
 - b. Cephalochordates, or lancelets
 - c. Vertebrates (hagfishes and lampreys; placoderms; sharks, skates, and rays; bony fishes; amphibians; reptiles; birds; mammals)

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the classification of living things

Algae	Birds	Flatworms:	Moss Animals:
Amphibians	Bryophytes	Phylum	Phylum Bryozoa
Angiosperms: The	Chordates	Platyhelminthes	Plants
Flowering Plants	Cnidarians	Fungi	Protists
Animals	Crustaceans	Gymnosperms	Protozoa
Annelids	Dinosaurs	Insects	Reptiles
Arachnids	Echinoderms	Lamp Shells:	Sponges: Phylum
Arthropods	Ferns and Other	Phylum	Porifera
Aschelminths	Lower Vascular	Brachiopoda	Viruses
Bacteria and Other	Plants	Mammals	
Monerans	Fishes	Mollusks	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>amphibians:</i>	<i>angiosperms—beech</i>	gray birch	chin cactus
amphibian	<i>order:</i>	hop-hornbeam	cholla
amphiuma	beech	hornbeam	Christmas cactus
arrow-poison frog	Betulaceae	paper birch	Easter cactus
axolotl	black oak	river birch	fishhook cactus
bullfrog	bur oak	sweet birch	hedgehog cactus
Cacops	chestnut	white birch	leaf cactus
caecilian	chestnut oak	yellow birch	living-rock cactus
clawed frog	chinquapin	<i>angiosperms—</i>	mammillaria
Diadectes	English oak	<i>buttercup order:</i>	melon cactus
Eryops	Fagales	anemone	night-blooming
fire-bellied toad	live oak	baneberry	cereus
frog	oak	barberry	old-man cactus
green frog	pin oak	Berberidaceae	Opuntia
hellbender	red oak	bugbane	organ-pipe cactus
Ichthyostega	tanbark oak	buttercup	peyote
labyrinthodont	white oak	Christmas rose	pincushion cactus
leopard frog	willow oak	Clematis	prickly pear
Leptodactylidae	<i>angiosperms—</i>	columbine	Rhipsalis
midwife toad	<i>bellflower order:</i>	globeflower	saguaro
mud puppy	balloonflower	hellebore	Schlumbergera
Myobatrachidae	bellflower	hepatica	sea-urchin cactus
narrow-mouthed	Campanulales	larkspur	<i>angiosperms—caper</i>
toad	harebell	mayapple	<i>order:</i>
newt	Lobeliaceae	meadow rue	Brassicaceae
salamander	rampion	monkshood	broccoli
Seymouria	tuftbell	Oregon grape	Brussels sprouts
siren	<i>angiosperms—birch</i>	Ranunculaceae	cabbage
spadefoot toad	<i>order:</i>	Ranunculales	candytuft
Surinam toad	alder	<i>angiosperms—cactus</i>	Capparales
tadpole	Balanopales	<i>order:</i>	cauliflower
toad	birch	barrel cactus	charlock
tree frog	filbert	cactus	Chinese cabbage

collard	ebony	<i>angiosperms—</i>	love grass
cress	persimmon	<i>gentian order:</i>	millet
kale	pimpernel	Apocynaceae	muhly
Kerguelen cabbage	primrose	Asclepiadaceae	needlegrass
kohlrabi	Primulales	bedstraw	oat grass
marsh cress	sapodilla	buckbean	oats
mustard	storax	carrión flower	panicum
peppergrass	<i>angiosperms—</i>	coffee	Paspalum
radish	<i>euphorbia order:</i>	Gentianales	Pennisetum
rape	boxwood	Indian hemp	Poaceae
rock cress	Buxaceae	Loganiaceae	quack grass
rocket	cassava	madder	reed
spiderflower	castor-oil plant	oleander	Restionales
stock	copperleaf	partridgeberry	rice
toothwort	croton	periwinkle	rye
turnip	crown of thorns	Rubiaceae	ryegrass
wallflower	Euphorbiaceae	<i>angiosperms—</i>	sorghum
whitlow grass	Euphorbiales	<i>geranium order:</i>	sugarcane
<i>angiosperms—</i>	jatropha	Barbados cherry	wheat
<i>composite order:</i>	jojoba	flax	wild rice
artichoke	manchineel	Geraniales	<i>angiosperms—heath</i>
Asteraceae	mercury	geranium	<i>order:</i>
basket-flower	Omphalea	Impatiens	Arbutus
boneset	Phyllanthus	lignum vitae	azalea
chamomile	poinsettia	nasturtium	bilberry
Chrysanthemum	redbird cactus	Oxalis	blueberry
cineraria	sandbox tree	shamrock	Clethra
coneflower	spurge	wood sorrel	cranberry
dandelion	tung tree	<i>angiosperms—ginger</i>	crowberry
endive	<i>angiosperms—figwort</i>	<i>order:</i>	Ericales
fleabane	<i>order:</i>	abaca	Gaultheria
goldenrod	Acanthaceae	arrowroot	heath
groundsel	ash	banana	heather
guayule	belladonna	bird-of-paradise	huckleberry
Jerusalem	Bignoniaceae	flower	Indian pipe
artichoke	bladderwort	Cannaceae	kalmia
lettuce	broomrape	ginger	kiwi
marigold	eggplant	ginger lily	Labrador
pussy-toes	figwort	Marantaceae	tea
safflower	forsythia	Musaceae	leatherleaf
sunflower	foxglove	plantain	Lyonia
thistle	Gesneriaceae	prayer plant	Pieris
zinnia	henbane	Strelitziaceae	pipsissewa
<i>angiosperms—</i>	Indian paint brush	Zingiberaceae	rhododendron
<i>dogwood order:</i>	jacaranda	Zingiberales	Vaccinium
angelica	jasmine	<i>angiosperms—grass</i>	wintergreen
anise	lilac	<i>families:</i>	<i>angiosperms—laurel</i>
Apiaceae	mullein	agrostology	<i>order:</i>
Araliaceae	nightshade	Arundinaria	avocado
carrot	Oleaceae	bamboo	California laurel
Cornales	olive	barley	greenheart
cow parsnip	petunia	beach grass	lambkill
dogwood	potato	bent grass	Laurales
fatsia	privet	bluegrass	laurel
ivy	sausage tree	bluestem	sassafras
parsnip	Scrophulariales	brome grass	sweet shrub
poison hemlock	Solanaceae	cordgrass	<i>angiosperms—lily</i>
schefflera	tea olive	corn	<i>and iris orders:</i>
tupelo	toadflax	crabgrass	Agavaceae
<i>angiosperms—ebony</i>	tobacco	esparto	Alliaceae
<i>and primrose orders:</i>	tomato	fescue	Amaryllidaceae
Bumelia	witchweed	foxtail	Asparagus
Ebenales		grass	

asphodel	Malvaceae	ramie	locust
bear grass	Malvales	Ulmaceae	logwood
bellwort	okra	Urticaceae	lupine
blue-eyed grass	roselle	Urticales	mesquite
cantala	sisal	<i>angiosperms—orchid</i>	mimosa
chive	Sterculiaceae	<i>order:</i>	narra
Colchicum	Tiliaceae	bucket orchid	pagoda tree
Crocus	urena	cattleya	palo verde
Dioscoreaceae	<i>angiosperms—mint</i>	Dendrobium	pea
Dracaena	<i>order:</i>	Epidendrum	peanut
elephant's-foot	balm	greenhood	redbud
Erythronium	Coleus	helleborine	rosewood
fritillary	dittany	jewel orchid	senna
garlic	dragonhead	ladies' tresses	sensitive plant
Gladiolus	glory-bower	lady's slipper	smoke tree
henequen	Lamiaceae	Odontoglossum	soybean
Iridaceae	Lamiales	Oncidium	sunn
Iris	Lantana	Ophrys	vetch
leek	lavender	orchid	Wisteria
Liliaceae	lemon verbena	Orchis	<i>angiosperms—pepper</i>
Liliales	Mentha	Pogonia	<i>and birthwort</i>
lily	peppermint	twayblade	<i>orders:</i>
mariposa lily	rosemary	Vanda	birthwort
Mauritius hemp	Salvia	vanilla	Peperomia
narcissus	spearmint	<i>angiosperms—palm</i>	Piperaceae
onion	teak	<i>and related orders:</i>	Piperales
phormium	Verbenaceae	Anthurium	wild ginger
pickerelweed	<i>angiosperms—myrtle</i>	Arales	<i>angiosperms—phlox</i>
Sansevieria	<i>order:</i>	Arecidae	<i>order:</i>
Smilax	allspice	Arisaema	alkanet
ti	cannonball tree	Arum	bindweed
tulip	Cuphea	babassu palm	borage
water hyacinth	Epilobium	calla	Boraginaceae
yam	Eucalyptus	coco de mer	bugloss
<i>angiosperms—</i>	Eugenia	coconut palm	Convolvulaceae
<i>magnolia order:</i>	fejjoa	Cyclanthales	dodder
Annonaceae	fireweed	date palm	forget-me-not
champac	Fuchsia	dumb cane	Hydrophyllaceae
cherimoya	guava	oil palm	Ipomoea
lancewood	jaboticaba	palm	Lennoaceae
magnolia	Leptospermum	Pandanales	Loasaceae
Magnoliaceae	loosestrife	Philodendron	Mertensia
Magnoliales	mangrove	skunk cabbage	phlox
Myristicaceae	mare's-tail	Typhales	Polemoniaceae
pawpaw	Myrtales	<i>angiosperms—pea</i>	Rivea
tulip tree	myrtle	<i>order:</i>	sweet potato
Winteraceae	Onagraceae	acacia	waterleaf
ylang-ylang	paperbark tree	Albizia	<i>angiosperms—</i>
<i>angiosperms—</i>	pomegranate	bean	<i>pineapple and</i>
<i>mallow order:</i>	water chestnut	bluebonnet	<i>related orders:</i>
Abutilon	<i>angiosperms—nettle</i>	broom	Aechmea
balsa	<i>order:</i>	chick-pea	Bromeliales
baobab	Cannabis	Clianthus	Commelinales
Bombacaceae	elm	clover	Cryptanthus
cacao	Ficus	cowpea	Dyckia
cotton	fig	crown vetch	Eriocaulales
durian	hackberry	Fabales	Juncals
hibiscus	hemp	honey locust	papyrus
jute	India rubber plant	indigo	pineapple
kapok	jackfruit	kudzu vine	Puya
kenaf	Moraceae	laburnum	Spanish moss
linden	mulberry	lentil	spiderwort
mallow	Osage orange	lespedeza	Tillandsia
	Pilea	locoweed	

- umbrella plant
 Zebrina
angiosperms—pink order:
 Amaranthaceae
 baby's breath
 beet
 Bougainvillea
 cactus
 campion
 carnation
 Caryophyllaceae
 Caryophyllales
 Celosia
 chard
 chickweed
 goosefoot
 Halogeton
 Lychnis
 Nyctaginaceae
 pigweed
 pink
 poke
 Portulacaceae
 purslane
 spinach
 sugar beet
angiosperms—poppy order:
 bleeding heart
 bloodroot
 bush poppy
 California poppy
 celandine
 Corydalis
 Fumariaceae
 fumitory
 horned poppy
 Hypecoaceae
 Papaveraceae
 Papaverales
 poppy
 prickly poppy
angiosperms—rose order:
 almond
 Amelanchier
 apple
 apricot
 Astilbe
 blackberry
 boysenberry
 cherry
 chokecherry
 cinquefoil
 Connaraceae
 cotoneaster
 crab apple
 currant
 Echeveria
 firethorn
 gooseberry
 hawthorn
- houseleek
 hydrangea
 kalanchoe
 loganberry
 loquat
 medlar
 nectarine
 peach
 pear
 Pittosporaceae
 plum
 quince
 raspberry
 Ribes
 Rosales
 rose
 Saxifragaceae
 saxifrage
 sedum
 spirea
 strawberry
 sweetbrier
angiosperms—sandalwood order:
 Australian
 Christmas tree
 Balanophoraceae
 bastard toadflax
 dwarf mistletoe
 Loranthaceae
 mistletoe
 sandalwood
 Santalaceae
 Santalales
 Viscaceae
angiosperms—soapberry order:
 Aceraceae
 akee
 Anacardiaceae
 bel fruit
 box elder
 buckeye
 Burseraceae
 cashew
 citron
 grapefruit
 guarana
 horse chestnut
 kumquat
 lemon
 lime
 litchi
 mahogany
 mango
 maple
 Meliaceae
 orange
 pili nut
 Pistacia
 poison ivy
 red maple
- Rhus
 Rutaceae
 Sapindales
 shaddock
 silver maple
 Simaroubaceae
 sugar maple
 sumac
 tree of heaven
angiosperms—staff-tree and buckthorn orders:
 alder buckthorn
 bittersweet
 buckthorn
 Ceanothus
 Celastraceae
 Celastrales
 Euonymus
 holly
 jujube
 Rhamnales
 Vitaceae
angiosperms—tamarisk order:
 boojum tree
 ocotillo
 Tamaricales
 tamarisk
angiosperms—tea order:
 Camellia
 Clusiaceae
 Dipterocarpaceae
 Elatinaceae
 franklinia
 gordonia
 mammee apple
 mangosteen
 Ochnaceae
 Saint-John's-wort
 stewartia
 Theaceae
 Theales
angiosperms—teasel order:
 Caprifoliaceae
 Dipsacales
 elder
 feverwort
 honeysuckle
 scabious
 snowberry
 teasel
 Valerianaceae
 viburnum
angiosperms—violet and related orders:
 begonia
 bottle gourd
 bryony
- cucumber
 Cucurbitaceae
 dishcloth gourd
 Flacourtiaceae
 gourd
 melon
 pansy
 papaya
 Passifloraceae
 passion-flower
 pumpkin
 rock rose
 squash
 sun rose
 Viola
 Violales
 watermelon
angiosperms—walnut order:
 butternut
 hickory
 Juglandales
 pecan
 walnut
angiosperms—water lily order:
 fanwort
 Nelumbonaceae
 Nymphaeales
 water lily
 water shield
angiosperms—water-plantain and related orders:
 Alismatales
 arrowhead
 Elodea
 Hydrocharitales
 Najadales
 pondweed
 water plantain
angiosperms—witch-hazel and related orders:
 Casuarinales
 Didymelales
 Eucommiales
 Fothergilla
 Hamamelidaceae
 Hamamelidae
 Hamamelidales
 katsura tree
 Myricales
 plane tree
 sweet gum
 Trochodendrales
 winter hazel
 witch hazel
angiosperms—other:
 Alismatidae
 aspen
 Barbeya
 buckwheat

buffalo berry	silk spider	pauropod	shoveler
burning bush	spider	sea spider	snow goose
carnivorous plant	sunspider	symphytan	stifftail
cobra plant	tarantula	trilobite	swan
Commelinidae	tick	<i>bacteria:</i>	teal
Cyperaceae	trap-door spider	actinomycete	whistling duck
Cyperales	whip scorpion	archaeobacterium	white-fronted goose
Daphne	wolf spider	bacillus	wigeon
Diapensiales	<i>arthropods—</i>	bacterium	wood duck
dicotyledon	<i>crustaceans:</i>	blue-green algae	<i>birds—caprimulgiform</i>
Dilleniaceae	amphipod	Clostridium	<i>and apodiform orders:</i>
Dilleniidae	barnacle	denitrifying	apodiform
everlasting	blue crab	bacteria	caprimulgiform
Haloragales	branchiopod	episome	chuck-will's-widow
hardwood	brine shrimp	eubacterium	crested swift
Illiciales	clam shrimp	gliding bacterium	frogmouth
Leitneriales	copepod	gram stain	hummingbird
lotus	crab	Haemophilus	nighthawk
macadamia	crayfish	Lactobacillus	nightjar
Magnoliidae	crustacean	Micrococcus	oilbird
monocotyledon	crustacean louse	mycoplasma	owlet frogmouth
Nepenthes	decapod	Pasteurella	poorwill
Nepenthes	Dungeness crab	pneumococcus	potoo
Paeoniaceae	fiddler crab	pseudomonad	swift
peony	fish louse	rickettsia	swiftlet
pitcher plant	gammarid	Salmonella	whippoorwill
Plumbaginales	ghost crab	sheathed bacteria	<i>birds—charadriiform</i>
Podostemales	gribble	Spirillum	<i>order:</i>
Polygalales	hermit crab	spirochete	auk
Polygonales	hooded shrimp	Staphylococcus	auklet
poplar	horseshoe shrimp	streptococcus	avocet
Proteales	isopod	Streptomyces	charadriiform
Rafflesiales	krill	sulfur bacterium	courser
rhubarb	land crab	vibrio	curlew
Rosidae	lobster	<i>birds—anseriform</i>	dotterel
Salicales	malacostracan	<i>order:</i>	dowitcher
Sarraceniaceae	mantis shrimp	Anatidae	godwit
Solanales	mussel shrimp	anseriform	great auk
sundew	mustache shrimp	black duck	greenshank
taro	opossum shrimp	bufflehead	guillemot
Theligonales	pea crab	Canada goose	gull
Thymelaeales	pill bug	canvasback	jacana
Triuridales	robber crab	dabbling duck	jaeger
Venus's-flytrap	sand flea	diving duck	killdeer
wild flower	scampi	duck	knot
willow	shrimp	eider	lapwing
<i>arthropods—</i>	skeleton shrimp	gadwall	murre
<i>arachnids:</i>	sow bug	goldeneye	murrelet
arachnid	spider crab	goose	oystercatcher
black widow	tadpole shrimp	magpie goose	painted snipe
brown spider	tanaid	mallard	phalarope
chigger	water flea	merganser	plover
crab spider	<i>arthropods—other:</i>	nene	pratincole
daddy longlegs	arthropod	perching duck	puffin
false scorpion	centipede	pintail	redshank
funnel weaver	eurypterid	pochard	ruff
funnel-web spider	giant water	redhead	sandpiper
garden spider	scorpion	ring-necked duck	seedsnipe
jumping spider	horseshoe crab	scaup	sheathbill
mite	insect	scoter	skimmer
nursery-web spider	millipede	screamer	skua
red spider	myriapod	sheldgoose	snipe
scorpion	Paradoxides	shelduck	stilt
			surfbird

tattler	<i>birds—extinct:</i>	<i>birds—passeriform</i>	jay
tern	Aepyornis	<i>order:</i>	kingbird
thickknee	Archaeopteryx	accentor	kinglet
turnstone	Diatryma	Aegithalidae	kiskadee
willet	Hesperornis	antbird	lark
woodcock	Ichthyornis	becard	laughing thrush
yellowlegs	<i>birds—falconiform</i>	bell-magpie	Leiothrix
<i>birds—columbiform</i>	<i>order:</i>	bellbird	lyrebird
<i>and psittaciform</i>	accipiter	bird-of-paradise	magpie
<i>orders:</i>	bald eagle	bishop	magpie-robin
bristlehead	bateleur	blackbird	manakin
cockatoo	bird of prey	Bombycillidae	mannikin
columbiform	buzzard	bowerbird	martin
conure	caracara	broadbill	meadowlark
dodo	condor	buffalo weaver	Mimidae
domestic pigeon	eagle	bulbul	mockingbird
lovebird	falcon	bunting	monarch
macaw	falconiform	butcherbird	Muscicapidae
parakeet	golden eagle	Callaeidae	mynah
parrot	goshawk	Campephagidae	Nectariniidae
passenger pigeon	gyrfalcon	canary	nightingale
pigeon	harrier	Carduelidae	nightingale thrush
psittaciform	hawk	catbird	nuthatch
sandgrouse	hobby	Certhiidae	oriole
turtledove	kestrel	chat	oropendola
wood pigeon	kite	chat-thrush	ovenbird
<i>birds—coraciiform</i>	lammergeier	chough	Panuridae
<i>and piciform orders:</i>	merlin	cisticola	Paridae
barbet	osprey	cock-of-the-rock	Parulidae
coraciiform	peregrine falcon	cordon bleu	passeriform
flicker	secretary bird	Corvidae	pewee
honey guide	sparrowhawk	Cotingidae	Philepittidae
hornbill	turkey vulture	creeper	phoebe
ivory-billed	vulture	crow	pipit
woodpecker	<i>birds—galliform and</i>	cuckoo-shrike	pitta
jacamar	<i>gruiform orders:</i>	currawong	Ploceidae
kingfisher	bustard	Dendrocolaptidae	prinia
kookaburra	button quail	dipper	quelea
motmot	coot	drongo	raven
piciform	crake	Emberizidae	redstart
piculet	crane	Estrildidae	Remizidae
puffbird	curassow	fairy bluebird	robin
roller	finfoot	false sunbird	rockfowl
sapsucker	galliform	fantail	rosefinch
toucan	gallinule	flowerpecker	scrub-bird
woodpecker	grouse	flycatcher	seed-eater
<i>birds—cuculiform</i>	gruiform	forktail	sharpbill
<i>and owl orders:</i>	guinea fowl	Furnariidae	shrike
ani	hoatzin	Galapagos finch	shrike-vireo
barn owl	jungle fowl	gnatcatcher	silky flycatcher
coucal	limpkin	goldfinch	song-babbler
cuckoo	megapode	grackle	songbird
cuculiform	mesite	Grallinidae	sparrow
eagle owl	partridge	grass finch	starling
fish owl	peacock	grosbeak	Sturnidae
ground cuckoo	pheasant	ground thrush	sunbird
hawk owl	ptarmigan	helmet-shrike	swallow
horned owl	quail	Hirundinidae	Sylviidae
owl	rail	honeycreeper	tailorbird
roadrunner	seriema	honeyeater	tanager
screech owl	trumpeter	house sparrow	tapaculo
short-eared owl	turkey	hypocoly	thickhead
turaco	whooping crane	Icteridae	thrush
wood owl		Irenidae	

- tit
 tityra
 towhee
 treecreeper
 Turdidae
 tyrannulet
 tyrant flycatcher
 umbrellabird
 vanga-shrike
 vireo
 wagtail
 warbler
 wattle-eye
 waxbill
 waxwing
 weaver
 white-eye
 whydah
 woodcreeper
 woodswallow
 woodwarbler
 wren
 Xenicidae
birds—others:
 albatross
 aviary
 aviculture
 bird
 bittern
 booby
 cassowary
 casuariiform
 ciconiiform
 coly
 Colymbiformes
 cormorant
 diving petrel
 egret
 emu
 flamingo
 frigate bird
 fulmar
 gannet
 grebe
 hammerhead
 heron
 ibis
 kiwi
 loon
 moa
 ornithology
 ostrich
 pelecaniform
 pelican
 penguin
 petrel
 plumage
 prion
 procellariiform
 rhea
 shearwater
 shoebill
 snakebird
- spoonbill
 stork
 storm petrel
 syrinx
 tinamou
 trogon
 tropic bird
bryophytes:
 bryophyte
 bug-on-a-stick
 carpet moss
 cord moss
 cushion moss
 granite moss
 hair-cap moss
 hornwort
 leafy liverwort
 liverwort
 luminous moss
 Marchantia
 moss
 peat moss
 tree moss
 wind-blown moss
classification:
 nomenclature
 taximetrics
 taxon
 taxonomy
enterocoelomates:
 acorn worm
 amphioxus
 arrowworm
 beardworm
 bêche-de-mer
 blastoid
 brittle star
 cake urchin
 carpoid
 chordate
 crinoid
 crown-of-thorns
 starfish
 echinoderm
 echinoid
 graptolite
 heart urchin
 hemichordate
 protochordate
 pterobranch
 sand dollar
 sea cucumber
 sea lily
 sea squirt
 sea urchin
 starfish
 tunicate
*fishes—atheriniform
 and related orders:*
 atheriniform
 dealfish
 dory
 flying fish
- grunion
 killifish
 lantern-eye fish
 live-bearer
 molly
 oarfish
 silversides
 spiny-finned
 fish
*fishes—
 batrachoidiform and
 related orders:*
 anglerfish
 batfish
 brotula
 cave fish
 clingfish
 cod
 frogfish
 goosefish
 grenadier
 hake
 paracanthopterygian
 pearlfish
 pollock
 toadfish
 whiting
*fishes—
 cartilaginous:*
 basking shark
 blue shark
 carcharhinid
 chimaera
 chondrichthian
 Cladoselache
 devil ray
 dogfish
 electric ray
 guitarfish
 hammerhead shark
 mackerel shark
 mako shark
 monkfish
 ray
 saw shark
 sawfish
 shark
 skate
 stingray
 thresher shark
 tiger shark
 white shark
*fishes—cypriniform
 and siluriform
 orders:*
 barb
 bitterling
 bullhead
 carp
 catfish
 characin
 chub
 corydoras
- dace
 electric catfish
 electric eel
 goldfish
 hatchetfish
 knife-fish
 labeo
 loach
 madtom
 minnow
 ostariophysan
 pencil fish
 piranha
 roach
 sucker
 tench
 tetra
 tigerfish
 wels
 zebra fish
*fishes—
 gasterosteiform
 order:*
 cornetfish
 gasterosteiform
 pipefish
 sea horse
 shrimpfish
 stickleback
 swamp eel
 trumpet fish
*fishes—jawless fish
 and placoderms:*
 Agnatha
 antiarch
 Arctolepis
 arthrodire
 Bothriolepis
 Cephalaspis
 hagfish
 lamprey
 ostracoderm
 Palaeospondylus
 placoderm
 spiny shark
*fishes—perciform
 order:*
 angelfish
 archer fish
 barracuda
 bass
 bigeye
 black bass
 blenny
 bluegill
 bonito
 butterfish
 butterfly fish
 carangid
 cichlid
 crappie
 damselfish
 darter

- discus fish
 dragonet
 drum
 fingerfish
 glassfish
 goatfish
 goby
 gourami
 grouper
 grunt
 hind
 hogfish
 jack
 jewfish
 labyrinth fish
 mackerel
 marlin
 mojarra
 moonfish
 mudskipper
 mullet
 Nile perch
 parrot fish
 perch
 perciform
 pikeperch
 pomfret
 pompano
 porgy
 prickleback
 remora
 sailfish
 scat
 sea bass
 sheepshead
 Siamese fighting fish
 sleeper
 slipmouth
 snapper
 snook
 soapfish
 spadefish
 spearfish
 spiny eel
 stargazer
 sunfish
 surfperch
 surgeonfish
 swordfish
 threadfin
 tilefish
 tripletail
 tuna
 weakfish
 weever
 wolffish
 wrasse
fishes—
pleuronectiform
and tetraodontiform
orders:
 boxfish
 dab
- filefish
 flatfish
 flounder
 halibut
 mola
 plaice
 porcupine fish
 puffer
 sole
 tetraodontiform
 triggerfish
 turbot
fishes—salmoniform
order:
 Atlantic salmon
 bristlemouth
 brook trout
 brown trout
 capelin
 char
 coho
 hatchetfish
 king salmon
 lake trout
 mudminnow
 pike
 rainbow trout
 salmon
 salmoniform
 sandfish
 scaleless dragonfish
 smelt
 spookfish
 trout
 viperfish
 whitefish
fishes—scorpaeniform
and related orders:
 dragonfish
 flathead
 flying gurnard
 greenling
 lion-fish
 lumpsucker
 poacher
 redfish
 scorpaeniform
 scorpion fish
 sculpin
 sea robin
 snailfish
 stonefish
 zebra fish
fishes—others:
 alewife
 anchovy
 bichir
 bony fish
 bowfin
 Cheirolepis
 chondrosteian
 clupeiform
 coelacanth
 crossopterygian
- deep-sea fish
 Dipterus
 eel
 elopiform
 Eusthenopteron
 fish
 gar
 gulper
 herring
 holostean
 ladyfish
 lungfish
 menhaden
 moray
 mormyrid
 notopterid
 osteoglossomorph
 paddlefish
 Rhipidistia
 sardine
 shad
 sturgeon
 tarpon
 teleost
 wolf herring
fungi:
 Agaricales
 Amanita
 Armillaria
 Ascomycetes
 Basidiomycetes
 Boletaceae
 cup fungus
 Deuteromycetes
 fungus
 Lycoperdales
 mushroom
 mycorrhiza
 Oomycetes
 Polyporales
 stinkhorn
 truffle
 water mold
 yeast
 Zygomycetes
gymnosperms:
 alerce
 American
 arbovitae
 Araucaria
 arbovitae
 bald cypress
 big tree
 California nutmeg
 cedar
 conifer
 Cordaitales
 Cupressaceae
 cycad
 Cycadeoidales
 Cycas
 cypress
 cypress pine
- dawn redwood
 Douglas fir
 eastern red cedar
 English yew
 Ephedra
 false cypress
 fir
 giant arbovitae
 ginkgo
 Glossopteris
 Gnetales
 gymnosperm
 hemlock
 incense cedar
 Japanese cedar
 Japanese torreyia
 Japanese yew
 juniper
 larch
 Lebachia
 Pinaceae
 pine
 Podocarpaceae
 redwood
 seed fern
 Sequoia
 spruce
 Taxaceae
 Taxodiaceae
 Torreyia
 umbrella pine
 Welwitschiaceae
 yellowwood
 yew
insects—coleopteran
order:
 alfalfa weevil
 bark beetle
 beetle
 bess beetle
 billbug
 blister beetle
 boll weevil
 branch and twig
 borer
 carrion beetle
 casebearing beetle
 chafer
 checkered beetle
 click beetle
 coleopteran
 Colorado potato
 beetle
 cucumber beetle
 darkling beetle
 dermestid beetle
 firefly
 flat bark beetle
 flea beetle
 glowworm
 ground beetle
 ladybird beetle
 leaf-rolling weevil
 long-horned beetle

metallic	honeybee	tussock moth	neuropteran
wood-boring	horntail	white butterfly	odonate
beetle	hymenopteran	yucca moth	orthopteran
plum curculio	ichneumon	zebra swallowtail	plant bug
potato beetle	leaf-cutter bee	butterfly	proturan
predaceous	sand wasp	<i>insects—others:</i>	psocid
diving beetle	sawfly	alderfly	pygmy grasshopper
primitive weevil	spider wasp	ambush bug	red bug
rhinoceros beetle	Symphyta	antlion	San Jose scale
rove beetle	thread-waisted	aphid	scale insect
scarab beetle	wasp	apterygote	scorpionfly
seed beetle	velvet ant	assassin bug	shield-backed
soldier beetle	wasp	back swimmer	katydid
spider beetle	wood wasp	bedbug	short-horned
stag beetle	<i>insects—lepidopteran</i>	bristletail	grasshopper
strepsipteran	<i>order:</i>	bug	smaller water
tiger beetle	bagworm moth	burrower bug	strider
tortoise beetle	blue butterfly	caddisfly	snakefly
tumbling flower	bollworm	chewing louse	springtail
beetle	brush-footed	chinch bug	stinkbug
unicorn beetle	butterfly	cicada	stonefly
water scavenger	butterfly	cockroach	sucking louse
beetle	carpenter moth	cone-headed	termite
weevil	casebearer	grasshopper	thrips
whirligig beetle	clearwing moth	coreid bug	treehopper
<i>insects—fly order:</i>	copper butterfly	cottony-cushion	walkingstick
anthomyiid fly	diamondback	scale	water boatman
bee fly	moth	cricket	water scorpion
biting midge	flour moth	dipluran	water strider
black fly	forester moth	dobsonfly	webspinner
blow fly	gelechiid moth	dragonfly	whitefly
bot fly	geometrid moth	earwig	<i>lophophorates:</i>
crane fly	gypsy moth	ephemeropteran	Atrypa
dipteran	hairstreak	flea	horseshoe worm
flesh fly	harvester	flower bug	lamp shell
fly	hawk moth	frohopper	lingulid
fruit fly	lappet	giant water bug	moss animal
fungus gnat	leaf roller moth	grape phylloxera	<i>lower invertebrates:</i>
gall midge	lepidopteran	grasshopper	archaeocyathid
Hessian fly	measuring worm	harlequin	Ascaris
horse fly	milkweed butterfly	cabbage bug	aschelminth
housefly	monarch butterfly	heteropteran	Aurelia
hover fly	morpho	homopteran	bread crumb
leaf miner	moth	human louse	sponge
louse fly	olethreutid moth	jumping plant	Cassiopea
midge	owlet moth	louse	Chrysaora
mosquito	painted lady	katydid	clionid
robber fly	parnassian	lace bug	cnidarian
tachinid fly	butterfly	lacewing	coral
tsetse fly	peppered moth	leaf insect	ctenophore
vinegar fly	pyralid moth	leafhopper	eelworm
warble fly	regal moth	locust	entoproct
<i>insects—</i>	saturniid moth	long-horned	eye worm
<i>hymenopteran order:</i>	silkworm moth	grasshopper	filarial worm
ant	skipper	louse	flatworm
Apocrita	slug caterpillar	lygaeid bug	flake
bee	moth	mantid	freshwater
braconid	sulfur butterfly	mantispid	jellyfish
bumblebee	swallowtail	marsh treader	gastrotrich
chalcid	butterfly	mayfly	Gonionemus
cuckoo wasp	tent caterpillar	meadow	guinea worm
fig wasp	moth	grasshopper	horn coral
gall wasp	tiger moth	mealybug	horny sponge
honey ant	tineid moth	mole cricket	Hydra

Hydractinia	gerenuk	African	olingo
hydroid	giraffe	hunting dog	otter
jellyfish	gnu	Arctic fox	ounce
Leucosolenia	goat	Asiatic black bear	Pallas's cat
Liriope	guanaco	badger	panda
lungworm	hartebeest	bat-eared fox	polar bear
medusa	hippopotamus	bear	polecat
mesozoan	ibex	bearded seal	procyonid
millepore	impala	binturong	puma
nematocyst	Kobus	black bear	raccoon
nematode	kudu	bobcat	raccoon dog
Obelia	llama	brown bear	ratel
pinworm	moose	bush dog	sable
planarian	mountain goat	cacomistle	sea lion
polyp	mule deer	Caffre cat	seal
Portuguese	muntjac	canine	serval
man-of-war	musk deer	caracal	skunk
priapulid	musk-ox	carnivore	sloth bear
ribbon worm	nyala	cat	South
rotifer	okapi	cheetah	American fox
sea anemone	oryx	civet	spectacled bear
sea fan	peccary	clouded leopard	sun bear
sea gooseberry	Père David's deer	coati	suricate
sea pen	pig	coyote	tayra
sea walnut	pronghorn	crabeater seal	tiger
siliceous sponge	red deer	dhole	viverrid
spiny-headed	reedbuck	dingo	walrus
worm	reindeer	dog	weasel
sponge	roe deer	elephant seal	Weddell seal
tapeworm	ruminant	ermine	wildcat
threadworm	saiga	fennec	wolf
trichina	sassaby	ferret	wolverine
Venus's flower	sheep	fisher	<i>mammals—cetacean</i>
basket	sika	flat-headed	<i>order:</i>
worm	springbok	cat	baleen whale
zoanthid	tahr	fossa	beaked whale
<i>mammals—</i>	vicuña	fox	beluga
<i>artiodactyl order:</i>	wapiti	fur seal	blue whale
alpaca	warthog	genet	bottlenose whale
antelope	water buffalo	golden cat	cetacean
aoudad	white-tailed deer	gray fox	dolphin
artiodactyl	yak	grison	fin whale
aurochs	<i>mammals—bat</i>	grizzly bear	gray whale
babirusa	<i>order:</i>	harbour seal	humpback whale
bighorn	bat	harp seal	killer whale
bison	brown bat	hooded seal	narwhal
boar	bulldog bat	hyena	pilot whale
bongo	disk bat	jackal	porpoise
bovid	false vampire bat	jaguar	right whale
brocket	free-tailed bat	jaguarundi	sei whale
buffalo	Hipposideridae	kinkajou	sperm whale
bush pig	horseshoe bat	leopard	whale
camel	Jamaican fruit bat	leopard cat	<i>mammals—extinct:</i>
cattle	New Zealand	linsang	Barylambda
chamois	short-tailed bat	lion	brontothere
chevrotain	Phyllostomatidae	lynx	Camelops
deer	Pteropodidae	margay	cave bear
dibatag	sheath-tailed bat	marten	Chalicotherium
duiker	vampire bat	mink	Condylarthra
eland	Vespertilionidae	mongoose	Coryphodon
fallow deer	<i>mammals—carnivore</i>	monk seal	Creodonta
gaur	<i>order:</i>	mustelid	dawn horse
gazelle	aardwolf	ocelot	Dinohyus

- Dryopithecus
 Elasmotherium
 Glyptodon
 Indricotherium
 Irish elk
 litoptern
 mammoth
 mastodon
 Merychippus
 Miacis
 Moeritherium
 Moropus
 multituberculata
 Notoungulata
 Oreopithecus
 Phenacodus
 sabre-toothed cat
 taeniodont
 Thylacosmilus
 titanotherium
 Toxodon
 Triconodon
 Uintatherium
 woolly rhinoceros .
*mammals—
 insectivore and
 edentate orders:*
 anteater
 armadillo
 edentate
 elephant shrew
 golden mole
 hedgehog
 insectivore
 mole
 otter shrew
 short-tailed shrew
 shrew
 sloth
 solenodon
 tenrec
*mammals—
 monotremes and
 marsupials:*
 bandicoot
 cuscus
 echidna
 glider
 kangaroo
 koala
 marsupial
 marsupial mole
 marsupial mouse
 monotreme
 native cat
 numbat
 opossum
 phalanger
 platypus
 rat kangaroo
 rat opossum
 Tasmanian devil
 Tasmanian wolf
- wallaby
 wombat
*mammals—
 perissodactyl
 order:*
 ass
 donkey
 equine
 horse
 mule
 perissodactyl
 Przewalski's horse
 rhinoceros
 tapir
 zebra
*mammals—primate
 order:*
 ape
 avahi
 aye-aye
 baboon
 bonobo
 capuchin monkey
 Celebes black ape
 chimpanzee
 colobus
 diana monkey
 drill
 durukuli
 galago
 gelada
 gibbon
 gorilla
 guenon
 hamadryas
 howler monkey
 indri
 langur
 lemur
 loris
 macaque
 mandrill
 mangabey
 marmoset
 monkey
 orangutan
 patas monkey
 potto
 primate
 proboscis monkey
 rhesus monkey
 saki
 siamang
 sifaka
 spider monkey
 squirrel monkey
 tarsier
 titi
 tree shrew
 uakari
 woolly monkey
 woolly spider
 monkey
- mammals—rodent
 order:*
 agouti
 bamboo rat
 bandicoot rat
 beaver
 cane rat
 capybara
 cavy
 chinchilla
 chipmunk
 cloud rat
 cotton rat
 dormouse
 field mouse
 flying squirrel
 gerbil
 gopher
 grasshopper
 mouse
 ground squirrel
 guinea pig
 gundi
 hamster
 harvest mouse
 hutia
 jerboa
 jumping mouse
 kangaroo rat
 lemming
 maned rat
 marmot
 mole rat
 mouse
 muskrat
 nutria
 paca
 pocket mouse
 porcupine
 pouched rat
 prairie dog
 rat
 rice rat
 rock rat
 rodent
 sewellel
 spiny rat
 springhare
 squirrel
 tuco-tuco
 viscacha
 vole
 water rat
 white-footed
 mouse
 wood rat
 woodchuck
mammals—others:
 aardvark
 colugo
 dugong
 elephant
 hare
- hyrax
 lagomorph
 mammal
 manatee
 pangolin
 pika
 proboscidean
 rabbit
 sea cow
 sirenian
 ungulate
protists—algae:
 Acetabularia
 alga
 algology
 brown algae
 Chlorella
 desmid
 diatom
 dulse
 Fucus
 green algae
 Irish moss
 kelp
 laver
 Nostoc
 Oedogonium
 phytoplankton
 Pleurococcus
 red algae
 Sargassum
 sea lettuce
 seaweed
 spirogyra
 stonewort
 Ulothrix
 Vaucheria
 water bloom
 water net
*protists—
 protozoans:*
 actinomyxidian
 amoeba
 apicomplexan
 astome
 Balantidium
 Ceratium
 Chlamydomonas
 chloromonad
 chrysomonad
 ciliate
 coccolith
 cryptomonad
 dinoflagellate
 Entamoeba
 entodiniomorph
 Euglena
 flagellate
 foraminiferan
 fusulinid
 gregarine
 Gymnodinium
 gymnostome

- haplosporidian
 helioflagellate
 heliozoan
 heterochlorid
 heterotrich
 Holomastigotoides
 hymenostome
 hypermastigote
 hypotrich
 microsporidian
 myxosporidian
 Nosema
 odontostome
 oligotrich
 opalinid
 Paramecium
 peritrich
 Plasmodium
 protomonad
 protozoan
 pseudopodium
 radiolarian
 rhizomastigote
 Sarcocystis
 sarcodine
 suctorian
 testacean
 tintinnid
 trichocyst
 trichomonad
 trichostome
 volvocid
 Volvox
 Vorticella
protists—others:
 beard lichen
 Iceland moss
 lichen
 manna
 Myxomycetes
 oak moss
 Parmelia
 Plasmodio-
 phoromycetes
 protist
 slime mold
reptiles—
crocodilians:
 alligator
 caiman
 crocodile
 gavial
reptiles—extinct:
 Albertosaurus
 Allosaurus
 Anatosaurus
 Ankylosaurus
 Apatosaurus
 brachiosaur
 Bradysaurus
 Camptosaurus
 carnosaur
 ceratopsian
 Ceratosaurus
 Clidastes
 Coelophysis
 cynodont
 Cynognathus
 Dicynodon
 Dimetrodon
 Dimorphodon
 dinosaur
 Diplodocus
 dromaeosaur
 Edaphosaurus
 Euparkeria
 Hypsilophodon
 ichthyosaur
 iguanodon
 Lambeosaurus
 Limnoscelis
 Maiasaura
 megalosaur
 Mesosaurus
 mosasaur
 Moschops
 Nothosaurus
 ornithischian
 Ornitholestes
 Ornithomimus
 ornithopod
 Oviraptor
 Pachycephalo-
 saurus
 Pentaceratops
 phytosaur
 Plateosaurus
 plesiosaur
 Protoceratops
 Psittacosaurus
 Pteranodon
 pterodactyl
 pterosaur
 Rhamphorhyn-
 chus
 saurischian
 sauropod
 sauropterygian
 Stegosaurus
 Struthiomimus
 thecodont
 therapsid
 theropod
 triceratops
 tritylodont
 tyrannosaur
reptiles—lizards:
 Agamidae
 anole
 chameleon
 gecko
 Gila monster
 glass snake
 horned toad
 iguana
 Komodo dragon
 lizard
 monitor lizard
 racerunner
 skink
reptiles—snakes:
 adder
 anaconda
 black snake
 blind snake
 boa
 boomslang
 brown snake
 bull snake
 bushmaster
 Cerastes
 coachwhip
 cobra
 colubrid
 copperhead
 coral snake
 egg-eating snake
 elapid
 fer-de-lance
 flying snake
 garter snake
 green snake
 hognose snake
 indigo snake
 king snake
 krait
 mamba
 mangrove snake
 moccasin
 python
 racer
 rat snake
 rattlesnake
 sea snake
 shieldtail snake
 sidewinder
 snake
 taipan
 tree snake
 vine snake
 viper
 wart snake
 water snake
reptiles—turtles:
 Blanding's turtle
 box turtle
 Emydidae
 mud turtle
 musk turtle
 painted turtle
 pond turtle
 sea turtle
 side-necked
 turtle
 snake-necked
 turtle
 snapping turtle
 softshell turtle
 terrapin
 tortoise
 turtle
 wood turtle
reptiles—others:
 archosaur
 reptile
 tuatara
schizocoelomates—
annelids:
 annelid
 earthworm
 fanworm
 feather-duster
 worm
 fireworm
 leech
 lugworm
 oligochaete
 palolo worm
 peacock worm
 polychaete
 rag worm
 sea mouse
schizocoelomates—
mollusks:
 ammonoid
 ark shell
 belemnoid
 bivalve
 bubble shell
 cephalopod
 chiton
 clam
 cockle
 conch
 cone shell
 coquina clam
 cowrie
 cuttlefish
 ear shell
 gaper clam
 gastropod
 geoduck
 jingle shell
 land snail
 mollusk
 monoplaco-
 phoran
 murex
 mussel
 nautilus
 nudibranch
 octopus
 olive shell
 opisthobranch
 oyster
 periwinkle
 piddock
 prosobranch
 pteropod
 pulmonate

razor clam	pentastomid	Lycophyta	tracheophyte
scallop	schizocoelomate	Marattiaceae	whisk fern
seashell	spoonworm	Ophioglossaceae	<i>viruses:</i>
shipworm	tardigrade	Osmundaceae	adenovirus
slug	trochophore	Pleuromeia	arbovirus
squid	<i>tracheophytes:</i>	Polypodiaceae	cytomegalovirus
top shell	Adiantaceae	prefern	lysogeny
triton shell	angiosperm	Psilotophyta	myxovirus
tusk shell	Aspleniaceae	quillwort	papillomavirus
whelk	bracken	Rhynie plants	picornavirus
worm shell	cliffbrake	Salviniales	plant virus
<i>schizocoelomates—</i>	club moss	Schizaeaceae	polyoma virus
<i>others:</i>	fern	Sphenophyta	poxvirus
oncopod	gymnosperm	spike moss	virion
onychophoran	horsetail	staghorn fern	virology
peanutworm	Lepidodendron		virus

Biographies

See Section 10/34 of Part Ten

INDEX: See entries under all of the terms above

Division II. The Molecular Basis of Vital Processes

[For Part Three headnote see page 95.]

The outlines in the three sections of Division II deal with the molecular level of biotic organization and set forth theories of the chemical transformations and the exchanges of energy that occur in the distinctively vital processes treated in Section 311 of Division I.

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322. Metabolism: Bioenergetics and Biosynthesis 115

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Section 321. Chemicals and the Vital Processes

A. The inorganic milieu of living systems

B. Organic chemicals participating naturally in the life processes

1. Carbohydrates

2. Lipids

3. Proteins and peptides

4. The major carrier of chemical energy: ATP

5. Nucleic acids

a. General features

b. Deoxyribonucleic acid (DNA)

c. Ribonucleic acid (RNA)

6. Biological pigments and coloration

7. Enzymes

8. Vitamins

9. Hormones

a. General features of hormones: relationship between endocrine regulation and neural regulation, the evolution of hormones

b. The hormones of vertebrates

c. The hormones and hormonelike substances of invertebrates: neurohormones, molting hormones, pheromones

d. The hormones of plants

10. Other natural products: alkaloids, steroids and sterols, isoprenoids and terpenes
- C. Drugs: chemicals administered to an organism to change its physiological state or to combat pathogens
 1. Sources and development of drugs
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 3. Absorption, distribution, metabolism, and excretion of drugs
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 - a. Drugs affecting the cardiovascular system
 - b. Drugs affecting smooth and skeletal muscle systems
 - c. Drugs affecting the central nervous system
 - d. Drugs affecting the autonomic nervous system and the eyes
 - e. Drugs affecting the excretory system
 - f. Drugs affecting the digestive system
 - g. Drugs affecting the reproductive systems
 - h. Drugs affecting the immune response system
 - i. Drugs affecting the histamine response system
 5. Drugs directed against disease organisms
 - a. Drugs derived from living microorganisms: antibiotics
 - b. Chemical compounds used to treat infectious diseases: chemotherapeutic drugs
 6. Drugs directed at the suppression of cancer
 7. Drug use and abuse: the nature of drug addiction and dependence
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- D. Ethyl alcohol, alcohol consumption
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- E. Biocides and biorepellents
 1. Antiseptics and disinfectants
 2. Biocides directed by mankind against animal and plant pests
 3. Biotoxins produced by microorganisms, plants, and animals: microbial toxins, phytotoxins, zootoxins
 4. Biological and chemical warfare agents
[see 736.A.6.]
- F. The selective concentration of chemicals by organisms

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with chemicals and the vital processes

Biochemical Components of Organisms	Drugs and Drug Action
Cells: Their Structures and Functions	Poisons and Poisoning
Chemical Compounds	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>biocides</i> :	fungicide	mycotoxin	monosaccharide
Agent Orange	herbicide	poison	pectin
aldrin	insecticide	toxin	polysaccharide
chemosterilant	Malathion	venom	starch
chloral	parathion	<i>carbohydrates</i> :	sugar
chlordane	phorate	carbohydrate	<i>drugs affecting the</i>
DDT	rodenticide	cellulose	<i>autonomic nervous</i>
dichlorobenzene	Toxaphene	disaccharide	<i>system</i> :
dimethoate	<i>biotoxins</i> :	glucose	adrenergic drug
fumigant	lambkill	glycoside	anticholinesterase

atropine
beta blocker
cholinergic drug
ganglion blocking
agent

neuromuscular
blocking agent
*drugs affecting the
cardiovascular
system:*

digitalis
heparin
nitroglycerin
drugs—analgesics:
acetaminophen
acetanilide
analgesic
antipyrine
aspirin
salicylic acid

drugs—anesthetics:
anesthetic
chloroform
cocaine
curare
cyclopropane
procaine
hydrochloride

drugs—antibiotics:
ampicillin
antibiotic
cephalosporin
erythromycin
penicillin
streptomycin
tetracycline

drugs—antiseptics:
Dakin's solution
iodoform
merbromin
silver nitrate

*drugs—
chemotherapeutic:*
allopurinol
anthelmintic
catechu
chloroquine
diethylcarbamazine
citrate
diethylstilbestrol
isoniazid
pamaquine
Prontosil
quinacrine
quinine
sulfa drug
sulfadiazine
sulfanilamide
sulfonamide

*drugs—
hallucinogens:*
bufotenine

DMT
hallucinogen
hashish
ibogaine
LSD
marijuana
mescaline
PCP
peyote
psilocin and
psilocybin
drugs—narcotics:
codeine
fentanyl
heroin
methadone
morphine
narcotic
opium

drugs—sedatives:
barbiturate
chloral hydrate
paraldehyde
sedative-hypnotic
drug
thalidomide

drugs—stimulants:
amphetamine
caffeine
imipramine
iproniazid
isocarboxazid
methamphetamine
stimulant
tranlycypromine

drugs—tranquilizers:
chlordiazepoxide
chlorpromazine
diazepam
lithium carbonate
meprobamate
reserpine
tranquilizer

*drugs—other drugs
and drug action:*
antacid
antagonism
antihistamine
antimicrobial
agent
astringent
colchicine
cytotoxic drug
diuretic
drug
ephedrine
laxative
phenol
coefficient
promethazine
quinidine

scopolamine
theophylline
urethane
*enzymes and enzyme
action:*
allosteric control
amylase
cofactor
cooperativity
enzyme
feedback inhibition
hydrolase
induction
inhibition
ligase
lipase
Michaelis–Menten
hypothesis
nuclease
pepsin
proteolytic enzyme
renin
serotonin
transaminase
zymogen

hormones:
aldosterone
androgen
corticoid
cortisol
enterogastrone
epinephrine and
norepinephrine
estrogen
growth hormone
hormone
insulin
luteinizing
hormone
melatonin
neurohormone
progesterone
testosterone

*isoprenoids and
terpenes:*
abietic acid
camphor
isoprene
limonene
menthol
pinene
terpene

lipids:
capsaicin
fatty acid
lecithin
lipid
phospholipid
prostaglandin
sphingolipid
triglyceride

nucleic acids:

adenine
cytosine
DNA
guanine
nucleic acid
nucleoside
nucleotide
RNA
thymine
uracil

*pigments and
coloration:*
auxochrome
carotene
chlorophyll
chromophore
flavonoid
melanin
phytol
porphyrin
quinone

*proteins and
peptides:*
actin
amino acid
collagen
glutamic acid
glutamine
gluten
histidine
histone
hydroxyproline
keratin
myoglobin
peptide
prolamin
protein
scleroprotein

*steroids and
sterols:*
cholesterol
cortisone
ergosterol
saponin
steroid hormone

vitamins:
biotin
carnitine
choline
folic acid
niacin
pantothenic acid
para-aminobenzoic
acid
vitamin
vitamin A
vitamin B complex
vitamin B₁
vitamin B₂
vitamin B₆
vitamin B₁₂

vitamin C	<i>other:</i>	denaturation	sapogenin
vitamin D	adenosine	histamine	secretion
vitamin E	triphosphate	piperine	
vitamin K			

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Section 322. Metabolism: Bioenergetics and Biosynthesis

A. Photosynthesis: the initiation of energy conversion in the biosphere
[see also 335.B.]

1. The biological importance of photosynthesis
2. Factors that influence the rate of photosynthesis and the energy efficiency of photosynthesis
3. Determination of the mechanism of photosynthesis
4. The site of the photosynthetic process in green plants: the chloroplast
5. The photosynthetic pigments
6. The energetics of photosynthesis: photoelectron transfer, photophosphorylation
7. The metabolic path of carbon in photosynthesis: the carbon reduction cycle

B. Metabolism: the totality of all chemical processes in the living organism

1. The fragmentation of complex molecules: catabolism
2. The combustion of food materials and the conservation of part of the energy in them: cellular respiration, oxidation and transduction
3. The biosynthesis of cell components: anabolism
4. Regulation of metabolism

C. The nitrogen cycle: nitrogen fixation, nitrification and denitrification

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with metabolism: bioenergetics and biosynthesis

Cells: Their Structures and Functions
Metabolism
Photosynthesis

MICROPAEDIA: Selected entries of reference information

General subjects

adenosine	catabolism	feedback inhibition	metabolism
triphosphate	cellular respiration	gluconeogenesis	photosynthesis
anabolism	chloroplast	induction	tricarboxylic acid
antimetabolite	cytochrome	inhibition	cycle

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Section 323. Vital Processes at the Molecular Level

- A. The cell membrane
 - 1. The nature of membranes
 - 2. Compartmentalization of the cell
 - 3. Movement of water across cell membranes: osmosis
 - 4. Movement of solutes through membranes in response to a concentration gradient
 - 5. Movement of solutes through membranes independent of concentration gradients: active transport, pinocytosis
- B. Bioelectricity
- C. The nerve impulse
 - 1. The structure of the neuron
 - 2. Characteristics of artificially stimulated nerve fibres
 - 3. Nature of the nerve impulse
 - 4. Transmission of the nerve impulse: the synapse
- D. Muscle contraction
 - 1. Contractile or motile activity of some type as a characteristic of all living things
 - 2. Striated, or skeletal, muscle in higher animals
 - 3. Cardiac muscle
 - 4. Smooth muscle
- E. Bioluminescence
 - 1. The significance of bioluminescence in behaviour, metabolism, and research
 - 2. The range and variety of bioluminescent organisms
 - 3. The biochemical events of light emission: enzymic and nonenzymic systems

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with vital processes at the molecular level

Cells: Their Structures and Functions
 Electricity and Magnetism
 Muscles and Muscle Systems
 Nerves and Nervous Systems

MICROPAEDIA: Selected entries of reference information

General subjects

acetylcholine	bioluminescence	membrane	osmosis
actin	end-plate potential	muscle	pinocytosis
action potential	excitatory	nervous system	resting potential
adrenaline and noradrenaline	postsynaptic potential	neuromuscular junction	sodium pump
all-or-none law	marine	neuron	synapse
bioelectricity	phosphorescence	neurotransmitter	

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Division III. The Structures and Functions of Organisms

[For Part Three headnote see page 95.]

Division I deals with the nature, origin, evolution, distinctive properties, and classification of living things. Division II deals with the molecular level of biotic organization. The outlines in the nine sections of Division III deal with life at the cellular level and at the organismic level.

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- 332. The Relation of Form and Function in Organisms 118
- 333. Coordination of Vital Processes: Regulation and Integration 120
- 334. Covering and Support: Integumentary, Skeletal, and Musculatory Systems 122
- 335. Nutrition: the Procurement and Processing of Nutrients 123
- 336. Gas Exchange, Internal Transport, and Elimination 124
- 337. Reproduction and Sex 126
- 338. Development: Growth, Differentiation, and Morphogenesis 128
- 339. Heredity: the Transmission of Traits 129

Section 331. The Cellular Basis of Form and Function

A. Cell theory and classification

1. The cell theory
 - a. Historical background
 - b. Challenges to and revisions of the cell theory in the light of later knowledge
2. Classification of cells
 - a. General features: comparisons between cells and viruses and between procaryotic and eucaryotic cells, tissues as providing a functional classification of cells
 - b. Cells and tissues of animals: absorptive cells, secretory cells, nerve cells, sensory cells, muscle cells, cells in supporting tissues, circulating cells, reproductive cells
 - c. Cells and tissues of higher plants: outstanding features of the plant cell; meristematic, epidermal, and other types of plant cells
 - d. Comparison between animal cells and plant cells

B. Cell design and cell organization

1. The cell as a molecular system
 - a. Macromolecules in cells: nucleic acids, proteins, polysaccharides
 - b. Small molecules in cells: lipids, nucleotides, amino acids, fatty acids
2. Form and structure of the cell
 - a. Sizes and shapes of cells
 - b. Morphological elements: parts of cells—cell membrane, extracellular matrix, mitochondria, ribosomes, cytoskeleton, nuclear envelope, chromosomes, nucleolus
 - c. Procaryotic and eucaryotic cells
[see also 312.A.3.b.]

C. Functional aspects of cells

1. The internal environment and the cell matrix: the concept of the cell as a “protoplasm,” the concept of the cell as a “bag” containing a water solution of molecules
2. Cell membranes
[see 323.A.]
3. Interplay of nucleus and cytoplasm
4. Cell movement: ciliary, flagellar, and amoeboid
5. Cells in combination: cohesion and communication to form tissues and multicellular organisms

D. The cell cycle

1. Cell growth: doubling of size, genetic replication, preparation for division

2. Cell division

- a. Mitosis: condensation of chromosomes and dissolution of nuclear envelope; splitting of chromosomes; formation of new nuclear envelopes
- b. Cytokinesis: constriction of animal cell into halves by contractile ring of actin filaments; division of plant cell by formation of cell plate and new cell wall
- c. Meiosis: division of germ cell into gametes, or reproductive cells, each with one-half of the genetic material of parent cell

E. Fertilization

1. Characteristics of the mature egg
2. Events of fertilization
3. Biochemical analysis of the events of fertilization
4. Mechanisms that aid in the union of gametes

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major article dealing with the cellular basis of form and function

Cells: Their Structures and Functions

MICROPAEDIA: Selected entries of reference information

General subjects

cell	cytoskeleton	meiosis	protoplasm
chromosome	fertilization	mitosis	receptor
cilium	fission	multicellular	recombination
cytology	flagellum	organism	ribosome
cytoplasm	gamete	nucleus	
cytoplasmic	in vitro	ploidy	
streaming	fertilization		

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Section 332. The Relation of Form and Function in Organisms

A. Biological form and function

B. Plant tissues and fluids: classification, organization, main functions

1. Relatively undifferentiated tissues of nonvascular plants
2. Well-differentiated tissues in vascular plants
 - a. Meristematic (cell-producing) tissues: apical, lateral, intercalary
 - b. Mature tissues
 - i. Dermal (protective) tissues: the epidermis of the primary plant body, the periderm of the secondary plant body
 - ii. Vascular (conducting) tissues: the xylem, the phloem
 - iii. Fundamental (ground) tissues: the parenchyma, the supportive collenchyma and sclerenchyma, the endodermis
3. Cells of plant tissues
[see 331.A.2.c.]

C. Organs of plants: tissue organization, functions, and types

1. Development of organs in vascular plants: internal and external morphology, tissue organization, functions, types, and modifications; the stem; the leaf; the root
2. Physiology of organs in vascular plants

3. Diverse sizes and forms of organ systems in vascular plants: potential for unlimited growth
 - a. Varieties of shoot systems
 - b. Varieties of root systems
 - c. Varieties of reproductive organs and organ systems
 4. Organs of nonvascular plants: analogues of stem, leaf, and root
 5. Evolution of plant organs and organ systems into the complex, multicellular state
- D. Animal tissues and fluids: classification, organization, and main functions
1. Classification of tissues: anatomical, embryological, functional
 2. Tissues for assimilation, storage, transport, and excretion: alimentary, liver, kidney, and lung tissues; blood and lymph
 3. Tissues for coordination: nervous and sensory tissues, endocrine tissues
 4. Tissues for support and movement: connective tissues, cartilage, bone, muscle
 5. Other tissues: reproductive tissues, hemopoietic tissues, tissue fluids
 6. Cells of animal tissues
[see 331.A.2.b.]
- E. Animal organs and organ systems
1. Specialized organ systems
 - a. Relating to the environment primarily: integumentary, skeletal, muscular, nervous, and endocrine systems
[see also 333.C. and D.; 334.A., B., and C.]
 - b. Serving cell metabolism primarily: digestive, respiratory, circulatory, and excretory systems
[see also 335.C.; 336.A., B., and C.]
 - c. Serving genetic continuity primarily: the reproductive system
 2. Interrelationships between organ systems: functional interdependence, feedback mechanisms
 3. Development of organ systems
[see also 338.D.]
 4. Evolution of organ systems

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the relation of form and function in organisms

Animals	Integumentary Systems
Blood	Muscles and Muscle Systems
Cells: Their Structures and Functions	Nerves and Nervous Systems
Circulation and Circulatory Systems	Plants
Digestion and Digestive Systems	Reproduction and Reproductive Systems
Endocrine Systems	Respiration and Respiratory Systems
Excretion and Excretory Systems	Supportive and Connective Tissues

MICROPAEDIA: Selected entries of reference information

General subjects

bark	inflorescence	phloem	symmetry
cambium	leaf	pistil	tissue
connective tissue	lignin	placenta	vascular bundle
cortex	meristem	root	vascular system
epithelium	mucus	sclerenchyma	vessel
flower	organ	sieve tube	wood
growth ring	parenchyma	stomate	xylem

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Section 333. Coordination of Vital Processes: Regulation and Integration

- A. Maintenance of steady states in biological systems: homeostasis
 - 1. The nature of homeostatic systems
 - 2. Homeostatic processes
 - 3. Homeostatic control hierarchies: homeostatic subsystems that serve either organisms or natural communities
 - 4. Origin and evolution of homeostasis
 - 5. Individual adjustments to gradual changes in the physical environment: acclimatization
 - 6. Inactive states accompanied by a lower than normal rate of metabolism: dormancy
- B. Information reception and processing: sensory reception
 - 1. Classification of sensory systems
 - a. According to location of receptors: exteroceptors, interoceptors
 - b. According to type of stimulus: photoreceptors, thermoreceptors, chemoreceptors, mechanoreceptors, electroreceptors, sound receptors
 - 2. Evolution of sensory systems: specialized organs and information-processing structures
 - 3. Sensory information: interactions between adjacent sense cells and sensory neurons
- C. Endocrine systems in animals
 - 1. General features of hormonal coordination: the relationships between endocrine and neural regulation
 - 2. Vertebrate endocrine systems
 - a. Relationships of endocrine glands to each other and to the blood
 - b. Structure and function
 - 3. Invertebrate endocrine systems: insects, crustaceans, annelid worms
 - 4. Comparative, adaptive, and evolutionary aspects of endocrine systems: the neurosecretory cell, hypothalamus-pituitary control systems
 - 5. The human endocrine system
[see 421.E.]
- D. Nervous systems in animals
 - 1. Comparison of chemical and nervous regulation: control mechanisms located between the stimulus and the response
 - 2. Nervous coordination
 - a. Intracellular coordination: general cytoplasmic responsiveness, or irritability, to a stimulus
 - b. Organelle systems: the channeling of responsiveness at the subcellular level within more complex protozoans
 - c. Nervous systems: the channeling of responsiveness at the cellular level within multicellular organisms
 - i. The neuron, or nerve cell
 - ii. The transmission of the nerve impulse and the synapse
[see 323.C.]
 - 3. Invertebrate nervous systems
 - a. Theories of the evolutionary origin of the nervous system
 - b. Diffuse nervous systems
 - c. Centralized nervous systems
 - 4. Vertebrate nervous systems
 - a. The central nervous system: the brain and its components; the spinal cord; the brain coverings (meninges), cavities, cerebrospinal fluid, and neuroglia (nonnervous tissue)

- b. The peripheral nervous system
- c. Embryonic development of the vertebrate nervous system
- d. Evolution of the vertebrate nervous system
- e. Biodynamics of the vertebrate nervous system
- 5. The human nervous system
[see 421.J.]

E. The biological clock: periodicity

- 1. Rhythms without apparent external correlates: brain waves, breathing, heartbeat
- 2. Rhythms correlated with natural geophysical cycles: solar-day rhythms, lunar-tidal rhythms, monthly rhythms, annual or seasonal rhythms, epochal rhythms
- 3. The mechanism of the biological clock
- 4. Factors affecting biological periodicities
- 5. The amplification and superimposition of individual rhythms in communities
[see 352.C.1.b.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the coordination of vital processes: regulation and integration

Endocrine Systems
Nerves and Nervous Systems
Sensory Reception

MICROPAEDIA: Selected entries of reference information

General subjects

<i>endocrine systems:</i>	ganglion	rod	lateral line system
adrenal gland	meninges	visual pigment	mechanoreception
endocrine system	nervous system	<i>sensory reception—</i>	receptor
parathyroid gland	neuron	<i>sound reception:</i>	sense
pituitary gland	reflex	ear	smell
secretion	spinal cord	echolocation	taste
thyroid gland	synapse	external auditory	thermoreception
<i>nervous systems:</i>	vagus nerve	canal	touch reception
adrenergic nerve	<i>sensory reception—</i>	sound reception	<i>other:</i>
fibre	<i>photoreception:</i>	tympanic	acclimatization
autonomic nervous	cone	membrane	biological rhythm
system	eye	vestibulocochlear	diapause
brain	eyespot	nerve	hibernation
cerebral fissure	macula lutea	<i>sensory reception—</i>	homeostasis
cerebrospinal fluid	photoreception	<i>other:</i>	tropism
cranial nerve	rhodopsin	chemoreception	

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Section 334. Covering and Support: Integumentary, Skeletal, and Musculatory Systems**A. The body covering**

1. General features of the body covering, of integument: comparisons among unicellular organisms, plants, and animals
2. Invertebrate integuments: organization and function
 - a. Cellular components and their derivatives
 - b. Noncellular coatings of the integument
3. Vertebrate integuments: cellular components and their derivatives
 - a. Skin layers: the epidermis, the dermis
 - b. Skin derivatives and appendages: skin glands and pigment; epidermal scales; claws, nails, and hoofs; horns and antlers; feathers and hair; dermal derivatives
4. Skin variations among vertebrates
5. Embryology and evolution of the vertebrate skin
6. The biodynamics of vertebrate skin
7. Human integument and derivatives: skin, hair, nails, sebaceous glands, sweat glands

B. The body skeleton

1. The roles of the body skeleton
2. Description and composition of the skeletal elements
 - a. Cuticular structures: bone, crystals, cuticle, ossicles, spicules
 - b. Semirigid structures: flexible cuticular structures, calcareous spicules that are not tightly packed, keratin, notochord, cartilage
 - c. Other elements: connective tissue, the hydrostatic skeleton, elastic structures, buoyancy devices
3. The invertebrate skeleton: organization and function
4. The vertebrate skeleton: structure and function
 - a. General features
 - b. Embryology of vertebrate skeletons
 - c. Vertebral column and thoracic skeleton
 - d. Appendicular skeleton: pectoral girdle, pelvic girdle, limbs
5. Joints in vertebrates and invertebrates permitting various types of movement
6. Properties of bone and its development
7. The human skeletal system

C. The body musculature

1. General features of muscle tissue: its role in movement, support, colour changes, temperature regulation, and discharge of certain glands; arrangement and gross function
2. Muscle contractile systems
 - a. Simple contractile systems: simple contractile fibrils and epithelio-muscular cells
 - b. Complex contractile tissues: striated muscle, smooth muscle
3. Muscle contraction
[see 323.D.]
4. Invertebrate muscle systems
5. Vertebrate muscle systems
 - a. Embryonic development and divisions of the muscular system
 - b. Evolution of the vertebrate musculatory system

- c. Function and regulation of muscle action
- d. Electric organs in certain fishes
- 6. The human musculatory system
[see 421.H.6. and 7.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with covering and support: integumentary, skeletal, and musculatory systems

Integumentary Systems
Muscles and Muscle Systems
Supportive and Connective Tissues

MICROPAEDIA: Selected entries of reference information

General subjects

<i>integument:</i>	extensor muscle	fontanel	<i>other:</i>
bark	flexor muscle	humerus	ankle
beak	gluteus muscle	joint	arm
claw	iliocostalis muscle	ligament	digit
dermis	latissimus dorsi	metacarpal	elbow
epidermis	levator muscle	occipital	face
exoskeleton	muscle	parietal bone	foot
feather	pectoralis muscle	pelvic girdle	hand
hair	sphincter muscle	radius	heel
horn	trapezius muscle	rib	hip
integument	triceps muscle	sacrum	jaw
mantle	<i>supportive and</i>	scapula	knee
nail	<i>connective tissues:</i>	skeleton	leg
scale	bone	skull	shoulder
test	carpal bone	sternum	tail
<i>musculature:</i>	cartilage	tarsal	thorax
abdominal muscle	clavicle	tibia	wrist
abductor muscle	connective tissue	ulna	
adductor muscle	femur	vertebral column	
biceps muscle	fibula	zygomatic arch	

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Section 335. Nutrition: the Procurement and Processing of Nutrients

A. The basic features of nutrition

1. The various nutritional patterns; *e.g.*, autotrophism and heterotrophism, phototrophism and chemotrophism
2. Methods of ingestion or penetration
[see C., below]
3. The essential nutrients: compounds that cannot be synthesized by an organism and must be supplied in food; the nutritional needs of organisms
4. Syntrophism: nutritional interrelationships in which the immediate or end products of metabolism of one organism may provide essential nutrients for another

B. Photosynthesis: the production of food in green plants [see also 322.A.]

C. Digestion and digestive systems

1. The contrast between autotrophs and heterotrophs

2. The alimentary system in animals other than humans
 - a. Invertebrate digestive systems: vacuolar systems, channel-network systems, saccular systems, tubular systems
 - b. Vertebrate digestive systems: oral cavity, teeth, and pharynx; esophagus and stomach; small intestine, pancreas, and liver; the large intestine
 - c. Embryology and evolutionary development of the vertebrate digestive system
 - d. Biodynamics of the vertebrate digestive system: control of secretions and intestinal movements
3. The human alimentary system
[see 421.D.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with nutrition: the procurement and processing of nutrients

Digestion and Digestive Systems
Nutrition

MICROPAEDIA: Selected entries of reference information

General subjects

<i>digestive system:</i>	<i>plica circularis</i>	<i>nutritional</i>	<i>other:</i>
alimentary	pylorus	type	bile
canal	rectum	protein	bilirubin
anal canal	small intestine	vitamin	chyme
anus	stomach	<i>oral cavity:</i>	feces
appendix	villus	canine tooth	intestinal gas
argentaffin cell	<i>ingestion and</i>	cementum	
cecum	<i>digestion:</i>	dentine	
colon	chewing	enamel	
digestion	defecation	gum	
esophagus	digestion	ivory	
gallbladder	peristalsis	palate	
gastric gland	swallowing	periodontal	
large intestine	<i>nutrients and</i>	membrane	
liver	<i>nutrition:</i>	saliva	
pancreas	carbohydrate	salivary gland	
Paneth's cell	fat	tongue	
pharynx	nutrition	tooth	

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Section 336. Gas Exchange, Internal Transport, and Elimination

- A. Respiration and respiratory systems
 1. The process of extracting oxygen and releasing carbon dioxide
 2. Gases in the environment: the range of respiratory problems faced by aquatic and terrestrial animals
 3. Basic types of respiratory structures
 - a. Respiratory organs of invertebrates: tracheae and gills
 - b. Respiratory organs of vertebrates: gills and lungs
 4. Dynamics of respiratory mechanisms
 5. The control of respiration: neural reflexes, muscular feedback, chemically sensitive controls
 6. Adaptation to special environmental conditions

7. The human respiratory system
[see 421.C.]

B. Circulation and circulatory systems

1. Circulation and transport patterns: general aspects common to all circulatory systems
 - a. Circulation in single cells: streaming movements within the protoplasm
 - b. Circulation in multicellular animals
2. The fluid media involved in circulation: blood and lymph
 - a. Evolutionary origins of circulating fluids
 - b. Plasma
 - c. Formed elements of the circulating fluid: red cells, white cells, platelets, thrombocytes
 - d. Lymphocytes and lymph in vertebrates
3. Transport systems in animals
 - a. Invertebrate circulatory systems
 - b. Vertebrate circulatory systems
 - c. Coronary circulation
 - d. Embryonic development of the circulatory system
 - e. Biodynamics of vertebrate circulation
 - f. The human cardiovascular system
[see 421.A.]
4. Plant internal transport

C. Elimination: the disposal of wastes

1. General features of elimination
2. Excretion and excretory systems
 - a. Excretory mechanisms
 - b. Invertebrate excretory systems
 - c. Vertebrate excretory systems
 - d. The evolution of the vertebrate excretory system
 - e. The human excretory system
[see 421.G.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with gas exchange, internal transport, and elimination

Cells: Their Structures and Functions
Circulation and Circulatory Systems
Excretion and Excretory Systems
Respiration and Respiratory Systems

MICROPAEDIA: Selected entries of reference information

General subjects

<i>blood and lymph:</i>	platelet	blood pressure	hepatic vein
agglutinin	serum albumin	capillary	lung
blood	thymus	cardiovascular	lymph node
complement	<i>circulatory and</i>	system	lymph nodule
erythrocyte	<i>respiratory systems:</i>	circulation	portal vein
hemoglobin	aorta	coronary artery	pulmonary
hemolysis	artery	diaphragm	circulation
leukocyte	asphyxia	diastole	pulse
lymph	atrium	gill	renal vein
lymphocyte		heart	respiration

systemic	<i>excretory systems:</i>	perspiration	phloem
circulation	cloaca	renal capsule	root
systole	excretion	renal pelvis	sieve tube
trachea	kidney	renal pyramid	translocation
valve	loop of Henle	urinary bladder	transpiration
vein	malpighian tubule	urine	transport
vena cava	nasal gland	<i>plant internal</i>	vascular bundle
venous sinus	nephridium	<i>transport system:</i>	vessel
ventricle	nephron	mass flow	xylem

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Section 337. Reproduction and Sex

- A. The forms of reproduction and their comparative adaptive significance
 1. Levels of reproduction
 - a. Molecular replication and reproduction
 - b. Cell reproduction: binary and multiple fission
 - c. Reproduction of organisms
[see A.2., below]
 - d. Life cycles of plants and animals
 2. Reproduction of organisms: sexual and asexual reproduction
 3. Natural selection and reproduction: the evolution of reproduction and variation control
[see also 312.C.]
- B. Sex and sexuality
 1. The distinctions between sex, sexuality, and reproduction
 2. Transduction and transformation as sexlike recombination in viruses and bacteria
 3. The adaptive significance of sex: establishment of genetic diversity
 4. The origin of sex and sexuality
 5. Sex patterns
 6. Determination of the sex of individuals
 - a. The sex chromosomes
 - b. Abnormal chromosome effects
 - c. The effect of parthenogenetic development
 - d. Environmental and hormonal influences
- C. The reproductive system in plants: its organization and function
 1. General features: asexual systems that create new plants identical to the parent plant, sexual systems that create new plants different from either of the two parents
 2. The sex organs of bryophytes
 - a. In liverworts and hornworts
 - b. In mosses
 3. The variations of sex organs in tracheophytes
 - a. In spore plants
 - b. In seed plants
 4. Variations in reproductive cycles: apogamy and apospory (apparent secondary loss of capacity for sexual reproduction)

5. The physiology of reproduction: the influence of internal and environmental factors on the maturation of sporophytes and gametophytes as manifested by their ability to produce spores and gametes
- D. The reproductive system in animals: its organization and function
1. General features
 2. Reproductive systems of invertebrates
 - a. Gonads, associated structures, and products in monoecious and dioecious types
 - b. Mechanisms that aid in the union of gametes
 - c. Specializations associated with parthenogenesis
 - d. Provisions for the developing embryo
[see 338.D.2.b.]
 3. Reproductive systems of vertebrates
 - a. Gonads, associated structures, and products
 - b. Adaptations for internal fertilization; *e.g.*, the cloaca, intromittent (copulatory) organs, accessory structures
 - c. Role of gonads in hormone cycles
 - d. Provision for the developing embryo
[see 338.D.2.b.]
 - e. The human reproductive system
[see 421.F.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with reproduction and sex

Behaviour, Animal
Reproduction and Reproductive Systems
Sex and Sexuality

MICROPAEDIA: Selected entries of reference information

General subjects

<i>plant reproduction:</i>	cross-fertilization	menopause	sperm
gametophyte	fertilization	menstruation	spermatogenesis
ovary	fission	ovary	testis
ovule	gestation	ovulation	<i>other:</i>
pistil	incubation	ovum	alternation of
pollen	meiosis	placenta	generations
pollination	parturition	uterus	courtship
propagation	recombination	vagina	fertility and
pseudocopulation	reproduction	<i>reproductive</i>	infertility
spore	self-fertilization	<i>system—male:</i>	gamete
sporophyte	sexual intercourse	bulbourethral	gonad
<i>reproductive</i>	viviparity	gland	hermaphroditism
<i>processes:</i>	<i>reproductive</i>	ductus deferens	orgasm
artificial	<i>system—female:</i>	epididyme	sex
insemination	egg	penis	sex chromosome
budding	estrus	prostate gland	
conjugation	fallopian tube	seminal vesicle	

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Section 338. Development: Growth, Differentiation, and Morphogenesis

- A. The nature and scope of biological development
- B. The constituent processes of development and their control
 - 1. Growth
 - 2. Morphogenesis
 - 3. Differentiation
 - 4. Control and integration of development
- C. Development of plants
 - 1. General features: types of life cycles, alternation of generations as independent phases of the life cycle
 - 2. Preparatory events
 - a. Formation of sex cells
 - b. Pollination
 - c. Fertilization
 - 3. Early development: from fertilized egg (zygote) to seedling
 - a. Embryo formation
 - b. Independent dormant stages and germination of the seeds and fruits of higher plants, dispersal
 - 4. Later development: the sporophyte plant body
- D. Development of animals
 - 1. Preparatory events: the egg and its activation by normal fertilization or by parthenogenesis
 - 2. Early development
 - a. Embryo formation: cleavage, gastrulation
 - b. Embryonic adaptations for the maintenance of the developing embryo: shell, yolk stores, membranous sacs, placenta
 - 3. Organ formation
 - 4. Postembryonic development: transformation of the newborn into the adult
- E. Aging and decline in animals: life span, death
[for aging in humans, see 422.A.]
 - 1. Senescence in mammals
 - 2. Causes of aging
 - 3. The duration of life
- F. Specialized patterns of development
 - 1. Biological regeneration
 - 2. The healing processes and scar tissue formation
 - 3. Biological malformation
 - 4. Twinning: multiple births
 - 5. Development in vitro: cell and tissue cultures
 - 6. Development of transplanted tissues and organs

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with development: growth, differentiation, and morphogenesis
 Death
 Growth and Development, Biological

MICROPAEDIA: Selected entries of reference information

General subjects

<i>animal development:</i>	larva	<i>development</i>	parthenocarp
amnion	metamorphosis	<i>processes:</i>	seed
blastocyst	neural crest	aging	<i>other:</i>
chorion	notochord	death	blastema
cleavage	nymph	development	dysplasia
ectoderm	paedomorphosis	histogenesis	monster
embryo	parturition	organogenesis	
endoderm	placenta	regeneration	
fetus	pupa	<i>plant development:</i>	
gastrula	segmentation	endosperm	
gestation	umbilical cord	germination	
incubation		fruit	

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Section 339. Heredity: the Transmission of Traits**A. Basic features of heredity**

1. Early speculations on the nature of heredity
2. Mendelian genetics: Mendel's experiments and their significance, the universality of Mendel's laws, interactions among genes and their variant forms (alleles)
3. The combined action of heredity and environment in producing an organism

B. The physical basis of heredity

1. Chromosomes and genes: the cellular basis of heredity
2. Molecular genetics: the chemical and molecular nature of genes, the genetic code and its mutations, the expression and regulation of genes, applications of molecular genetics

C. Heredity and evolution

[see also 312.C.]

1. Population genetics: the gene pool, the Hardy-Weinberg principle, changes in gene frequencies
2. Natural selection as an agent of evolutionary change
3. Artificial selection for genetic improvements of selected organisms: domesticated animals, cultivated plants, humankind
[see also 355.B.3.]
4. Outbreeding and inbreeding: the effects of consanguinity on the vigour of offspring

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major article dealing with heredity: the transmission of traits

Genetics and Heredity, The Principles of

MICROPAEDIA: Selected entries of reference information

General subjects

albinism	genetic code	inbreeding	plasmid
allele	genetic drift	linkage group	polyploidy
character	genotype	Mendelism	recessiveness
chimera	Hardy-Weinberg	mutation	testcross
chromosome	law	operon	transformation
dominance	heredity	pedigree	variation
gene	hybrid	phenotype	

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Division IV. Behavioral Responses of Organisms

[For Part Three headnote see page 95.]

Several of the sections in Division III deal with the structure and internal functioning of organisms. The outlines in the two sections of Division IV deal with the external actions and reactions of living things in relation to changes in their environment.

Section 341. Nature and Patterns of Behavioral Responses 130

342. Development and Range of Behavioral Capacities: Individual and Group Behaviour 131

Section 341. Nature and Patterns of Behavioral Responses

- A. Diverse conceptions of animal behaviour
 - 1. The variety of animal behaviour
 - 2. Classification of animal behaviour
 - 3. Components of animal behaviour
- B. Patterns of stereotyped response: unlearned behavioral reactions of organisms to some environmental stimulus
 - 1. Plant movements: tropic and nastic movements, nutation, other autonomous movements
 - 2. Animal movements: reflex and reflexlike activities, taxes, fixed action patterns and instinct
 - 3. Photoperiodism
- C. Hormonal and nervous control of behaviour
 - 1. Interaction of endocrine and nervous systems
 - 2. Hormonal influences on behaviour; *e.g.*, by sex hormones
 - 3. The nervous system and behaviour: the role of the nervous system in receiving information, processing it in the brain and spinal cord, and initiating the appropriate response
- D. Evolution of behaviour
 - 1. Evidence of the genetic determination of behaviour
 - 2. The influence of experience on behaviour: phyletic patterns in the evolution of learning
 - 3. Evolutionary origins and evolutionary consequences of behaviour patterns

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major article dealing with the nature and patterns of behavioral responses

• Behaviour, Animal

MICROPAEDIA: Selected entries of reference information

General subjects

animal behaviour

instinct

play

tropism

behaviour genetics

photoperiodism

reflex

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Section 342. Development and Range of Behavioral Capacities: Individual and Group Behaviour

- A. Basic behavioral activities of individuals
 - 1. Food getting
 - 2. Locomotion
 - 3. Avoidance behaviour
 - 4. Aggressive behaviour: attack and defensive threats
 - 5. Behaviour related to habitat
 - 6. Behaviour related to reproduction
- B. Higher behavioral characteristics of individual animals
 - 1. Simple nonassociative learning; *e.g.*, habituation, sensitization
 - 2. Associative learning; *e.g.*, classical and instrumental, or operant, conditioning
 - 3. Spatial learning; *e.g.*, maze learning, navigation
 - 4. Perceptual learning: imitation and observational learning; *e.g.*, song learning, imprinting
 - 5. Complex problem solving
 - a. Discriminations of relational and abstract stimuli
 - b. Generalized rule learning
 - c. Insight and reasoning
 - d. Language learning
- C. The behaviour of animals in groups
 - 1. Distinctions between groups of social animals and groups of nonsocial ones
 - 2. Animal communication
 - 3. The range of social behaviour among social and nonsocial animals
 - 4. Dynamics of social behaviour
- D. Evolution of behaviour
[see 341.D.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the development and range of behavioral capacities: individual and group behaviour

Behaviour, Animal
Learning, Animal

MICROPAEDIA: Selected entries of reference information

General subjects

aggressive behaviour	brooding	habituation	sound production
alarm signal	cannibalism	homing	submissive behaviour
animal behaviour	cleaning behaviour	imprinting	suckling
animal	colony	learning	terrestrial
communication	conditioning	locomotion	locomotion
aquatic locomotion	courtship	motivation	territorial behaviour
associative learning	display behaviour	nest	
avoidance	dominance	pheromone	
behaviour	hierarchy	predation	
bird song	feeding behaviour	reproductive behaviour	
brachiation	flight	scavenger	
	habit		

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Division V. The Biosphere: the World of Living Things

[For Part Three headnote see page 95.]

Division I of Part Three deals with the nature, origin, evolution, distinctive properties, and classification of living things. Divisions II, III, and IV deal with life at the molecular, cellular, organismal, and behavioral levels.

The outlines in the five sections of Division V deal with the world of living things taken as a single system of biotic and environmental interactions and interdependencies.

- Section 351. Basic Features of the Biosphere 132
 - 352. Biological Populations and Communities 133
 - 353. Hazards of Life in the Biosphere: Disease and Death 135
 - 354. Biogeographic Distribution of Organisms: Ecosystems 136
 - 355. The Place of Humans in the Biosphere 137

Section 351. Basic Features of the Biosphere

- A. The extent of the biosphere
 - 1. Preconditions of the biosphere: the Earth as an ideal medium for life
[see 312.A.2.]
 - 2. The levels of organization within the biosphere: the biocycle, the ecosystem, the community, the population
[see 352.A. and C.; 354]
 - 3. Energy flow in the biosphere
 - 4. Cycling of matter in the biosphere
 - a. The general pattern of chemical cycles in nature
[see also 214.C.]
 - b. The carbon and oxygen cycles
 - c. The nitrogen cycle
 - d. The sulfur cycle
 - e. The water cycle
[see also 222.D.]
 - f. The sedimentary cycles of essential minerals
 - 5. The concept of the noosphere: mankind's place in the biosphere
[see 355.B.]
- B. The ecosystem: a collection of integrated communities and their environment
 - 1. Definition of an ecosystem
 - 2. The biotic components of the ecosystem
 - a. Producers
 - b. Consumers
 - c. Decomposers
 - 3. The abiotic components of the ecosystem
 - a. Pressure and temperature
[see 223.E.1.]
 - b. Radiation
 - c. Illumination

- d. Water and soil characteristics, salts
- e. Wave action: wind and water
- f. Fire as a limiting factor
4. The conditioning of the abiotic environment by living organisms
5. The effect of microenvironments on the ecosystem
6. Processes that determine the nature and productivity of the ecosystem
7. Types of ecosystems
[see 354]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major article dealing with the basic features of the biosphere

Biosphere, The

MICROPAEDIA: Selected entries of reference information

General subjects

biochemical	carbon cycle	nitrogen cycle	sulfur cycle
oxygen demand	ecosystem	oxygen cycle	vernalization
biogeochemical	eutrophication	phosphorus	
cycle	food chain	cycle	
biosphere	microclimate		
body heat			

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Section 352. Biological Populations and Communities

A. Biological populations

1. The study of populations
[see 10/34.B.4.]
2. The measurable characteristics of biological populations
 - a. Age, sex, and genetic differences and their distribution
 - b. Numbers and density: the effects of natality and mortality, the reproductive rate and death rate
3. Growth of populations: growth form and carrying capacity
4. Fluctuations in stable populations: variations in population size
5. Movements: migration; emigration; dispersion; dispersal; the influence of topographical, climatic, and biological barriers
6. Interactions of populations
[see B., below]
7. Factors affecting the structure of human populations
[see 524.A.]

B. Biotic interactions

1. Intraspecific interactions: positive and negative interactions of individuals within a species
2. Interspecific interactions: interactions among members of different species
 - a. The range of interspecies associations
 - b. Negative interactions, in which one or both populations are harmed: consumption, parasitic interactions, amensalism and antagonism

- c. Positive interactions, in which one or both populations are benefited: commensalism, mutualism
 - d. Neutralistic interactions
- 3. Interactions between populations of different species and the ecological, evolutionary, and biogeographical aspects of interaction on the population level
- C. Biological communities
 - 1. Community structure
 - a. Vertical and horizontal patterns: the influence of variations in environmental conditions on the stratification and zonation of organisms
 - b. Time relations: periodicity and population changes in the community
 - c. Interactions in the community: heterotrophic nutrition, predation, symbiosis
 - d. Niches and species diversity
 - e. Ecotones and the "edge effect"
 - 2. Community function: energy flow
 - 3. Community succession: growth toward a stable, mature condition
 - 4. Communities in space
 - a. Landscape patterns: the habitats of a landscape as forming a pattern of environmental gradients
 - b. Climax interpretation: monocl意思 theory, polyclimax theory, and climax pattern hypothesis
 - c. Community gradients: coenclines
 - 5. Community classification and its bases
 - a. The association as the unit of classification
 - b. The biome or formation as the unit of classification
 - c. Other bases for classification: *e.g.*, ecological succession, habitat, community metabolism
 - 6. Community structure in past ages: biogeographical succession
[see 242.B. and 243]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with biological populations and communities

Behaviour, Animal
Biosphere, The

MICROPAEDIA: Selected entries of reference information

General subjects

amensalism	ecology	homing	parasitology
biome	ecosystem	migration	predation
carnivore	ecotone	mutualism	symbiosis
commensalism	epiphyte	niche	trophic level
community	flyway	parasitism	
competition	herbivore		

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Section 353. Hazards of Life in the Biosphere: Disease and Death

- A. Disease as a departure from the "normal" state, or a disruption of homeostasis; death as the irreparable disruption of life processes
1. The nature of noncommunicable disease: metabolic defects, environmental hazards
 2. The nature of communicable, or contagious, disease
 - a. The multifactorial concept of contagious disease
 - b. Endemic disease and epidemic disease
 3. Immunity
[see also 422.C.2.]
 4. Control of disease: prevention, treatment
- B. Plant diseases
- C. Animal diseases
- D. Human diseases
[see 423]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with hazards of life in the biosphere: disease and death

Death
Disease
Immunity

MICROPAEDIA: Selected entries of reference information

General subjects

<i>animal diseases and zoonoses:</i>	malaria	autoimmunity	ergot
actinomycosis	mastitis	drug allergy	fruit spot
African swine fever	mycosis	immunity	leaf blister
anthrax	myopathy	immunization	mosaic
ascariasis	nagana	interferon	Panama disease
aspergillosis	pox disease	interleukin	powdery mildew
bloat	Q fever	phagocytosis	psoriasis
brucellosis	rabies	toxoid	rot
canine distemper	Rift Valley fever	vaccine	rust
cestodiasis	rinderpest	variolation	scab
coccidiosis	salmonellosis	<i>plant diseases:</i>	scorch
equine encephalitis	scrapie	aster yellows	smut
erysipelotheix	strangles	black knot	snow mold
infection	swine fever	black spot	sunscald
feline distemper	toxoplasmosis	blight	wilt
foot-and-mouth disease	trichomoniasis	bulb rot	<i>other:</i>
glanders	tularemia	bunt	bacteria
histoplasmosis	yellow fever	canker	disease
hookworm disease	zoonosis	clubroot	drowning
hyperkeratosis	<i>immunity and immunization:</i>	crown gall	epidemic
leptospirosis	antibody	curly top	germfree life
listeriosis	antigen	damping-off	prion
lungworm	antitoxin	dieback	quarantine
	autoantibody	downy mildew	veterinary science
		Dutch elm disease	virus

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Section 354. Biogeographic Distribution of Organisms: Ecosystems**A. Terrestrial ecosystems**

1. The land environment
 - a. Land as a medium for life and the comparison of the terrestrial and aquatic ecosystems
 - b. Limiting factors to living on land
 - c. Major terrestrial biomes: the tundra, the coniferous forest, the middle-latitude forest, the tropical rain forest, the grassland and savanna, the scrublands, the desert
 - d. Specialized biomes: polar biomes, subterranean biomes
2. Major life-forms
 - a. Growth habits and indicator organisms
 - b. Classification by habitat: soil organisms, trees and other rooted plants, epiphytes and periphytes, permeants
 - c. Classification by niche: producers, consumers, decomposers
3. Productivity in terrestrial ecosystems

B. Aquatic ecosystems

1. The aquatic environment
2. The ocean and its communities: communities of the open sea
 - a. The sea as a biological environment
 - b. Character of oceanic populations: benthos, plankton, nekton
 - c. Adaptations to marine conditions
 - d. Productivity of marine communities as judged by biological oxygen consumption or by nutrient concentration
3. Inland waters and their communities: freshwater communities
 - a. Lacustrine, or standing-water, communities: in lakes and ponds; in swamps, marshes, and bogs
 - b. Riverine, or flowing-water, communities: in rivers and streams, in springs
4. Boundary ecosystems: between waters or between water and land
 - a. Estuarine communities: communities in brackish water
 - b. Neritic communities: life along seacoasts
5. Productivity in aquatic ecosystems: the problem of determining productivity, comparisons of productivity

C. The distribution of organisms**D. Biogeographic regions and their inhabitants: regional floras and faunas**

1. The Megagaeon realm
 - a. Holarctic region: the nontropical parts of Eurasia, northern Africa, and North America
 - b. Ethiopian region: Africa south of the Sahara, southwestern Arabia, Madagascar
 - c. Oriental region: tropical southern and southeastern Asia
2. The Notogaeon realm: Australia, New Guinea, New Zealand, tropical Pacific islands
3. The Neogaeon realm: Central and South America
4. The Antarctic realm: Antarctica and most of the sub-Antarctic islands

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with biogeographic distribution of organisms: ecosystems

Biosphere and Concepts
of Ecology, The
Lakes
Oceans

Rivers
Trees

MICROPAEDIA: Selected entries of reference information

General subjects

<i>biogeographic regions:</i>	plain	<i>ocean layers:</i>	Mediterranean
Australian region	prairie	abyssal zone	vegetation
Ethiopian region	savanna	air-sea	scrubland
faunal region	turf	interface	thorn forest
floristic region	<i>ecosystems—</i>	bathyal zone	<i>other:</i>
Holarctic region	<i>other:</i>	bottom water	dispersion
Neotropical region	biome	halocline	land bridge
<i>ecosystems—forests:</i>	desert	littoral zone	Marine
cloud forest	ecosystem	pelagic zone	Biological
coniferous forest	estuary	photic zone	Laboratory
deciduous forest	lacustrine	<i>ocean populations:</i>	mesofauna
forest	ecosystem	benthos	shrub
rainforest	polar	nekton	soil organism
<i>ecosystems—</i>	biome	plankton	tree
<i>grasslands:</i>	rangeland	zooplankton	Wallace's Line
grassland	riverine ecosystem	<i>scrublands:</i>	
	tundra	chaparral	

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Section 355. The Place of Humans in the Biosphere**A. The qualities that set human beings apart in the biosphere**

1. Structural characteristics and physical capabilities providing humans with a versatility unparalleled in the biosphere
2. Physiological characteristics underlying the unique behaviour of humans: lack of a definite breeding season, long life span with slow development and lengthy dependency to maturity
3. Behavioral capacity as the basis of the unique culture of humans: communication through propositional speech, intellect and conceptualization

B. The effects of human action upon the biosphere

1. The influence of the human species on the modification of the environment
2. The influence of the environment on the modification of the human species
3. The attempts to change genetic endowments through deliberate selective measures: eugenics

C. The utilization of organisms by humans

1. Domestication of plants and animals: distribution and development
2. The cultivation of plants: plant breeding and growing
3. The uses of plants
[see also 724.C.8. and 731]
4. The cultivation of animals: animal breeding and raising
5. Major uses of animals
[see also 724.C.8. and 731]

6. The maintenance of public and private collections of live and preserved animals and plants
 - a. Museums of natural history
 - b. Zoological gardens and aviaries
 - c. Institutional and private aquariums
 - d. Botanical gardens and arboretums
- D. The conservation and management of natural resources
 1. The nature and scope of conservation management
 2. Types of natural resources
 3. Management of natural resources
 4. Management of the world's food supply
 - a. The problem of food supply: special difficulties facing the developing countries
 - b. Attempts to increase the production and utilization of food supplies: the quest for new sources of food and food additives

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the place of humans in the biosphere

Biosphere and Concepts of Ecology, The	Farming and Agricultural Technology
Cats, Domestic	Forestry and Wood Production
Conservation of Natural Resources	Gardening and Horticulture
Dogs	Horses and Horsemanship

MICROPAEDIA: Selected entries of reference information

General subjects

<i>conservation and management of natural resources:</i>	nature reserve	domestic cat	vegetable
conservation	surface mining	domestication	zoo
desalination	terrace cultivation	fowl	<i>pollution and pollution control:</i>
drainage	wildlife	fruit	acid rain
ecosystem	conservation	gardening	emission-control system
endangered species	<i>domestication and raising of plants and animals:</i>	genecentre	greenhouse effect
flood	animal breeding	horse	pollution
forestry	animals, cruelty to	horticulture	refuse disposal system
Greenpeace	aquarium	hydroponics	sewage system
hunting	arboriculture	livestock	smog
irrigation	botanical garden	oceanarium	water purification
materials salvage	breed association	pet	
national forest	cereal	plant breeding	
national park	dog	studbook	
		terrarium	

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Introduction to Part Four: The Cosmic Orphan

by Loren Eiseley

When I was a young lad of that indefinite but important age when one begins to ask, Who am I? Why am I here? What is the nature of my kind? What is growing up? What is the world? How long shall I live in it? Where shall I go? I found myself walking with a small companion over a high railroad trestle that spanned a stream, a country bridge, and a road. One could look fearfully down, between the ties, at the shallows and ripples in the shining water some 50 feet below. One was also doing a forbidden thing, against which our parents constantly warned. One must not be caught on the black bridge by a train. Something terrible might happen, a thing called death.

From the abutment of the bridge we gazed down upon the water and saw among the pebbles the shape of an animal we knew only from picture books—a turtle, a very large, dark mahogany-coloured turtle. We scrambled down the embankment to observe him more closely. From the little bridge a few feet above the stream, I saw that the turtle, whose beautiful markings shone in the afternoon sun, was not alive and that his flippers waved aimlessly in the rushing water. The reason for his death was plain. Not too long before we had come upon the trestle, someone engaged in idle practice with a repeating rifle had stitched a row of bullet holes across the turtle's carapace and sauntered on.

My father had once explained to me that it took a long time to make a big turtle, years really, in the sunlight and the water and the mud. I turned the ancient creature over and fingered the etched shell with its forlorn flippers flopping grotesquely. The question rose up unbidden. Why did the man have to kill something living that could never be replaced? I laid the turtle down in the water and gave it a little shove. It entered the current and began to drift away. "Let's go home," I said to my companion. From that moment I think I began to grow up.

"Papa," I said in the evening by the oil lamp in our kitchen. "Tell me how men got here." Papa paused. Like many fathers of that time, he was worn from long hours, he was not highly educated, but he had a beautiful resonant voice and he had been born on a frontier homestead. He knew the ritual way the Plains Indians opened a story.

"Son," he said, taking the pattern of another people for our own, "once there was a poor orphan." He said it in such a way that I sat down at his feet. "Once there was a poor orphan with no one to teach him either his way, or his manners. Sometimes animals helped him, sometimes supernatural beings. But above all, one thing was evident. Unlike other occupants of Earth he had to be helped. He did not know his place, he had to find it. Sometimes he was arrogant and had to learn humility, sometimes he was a coward and had to be taught bravery. Sometimes he did not understand his Mother Earth and suffered for it. The old ones who starved and sought visions on hilltops had

known these things. They were all gone now and the magic had departed with them. The orphan was alone; he had to learn by himself; it was a hard school."

My father tousled my head; he gently touched my heart. "You will learn in time there is much pain here," he said. "Men will give it to you, time will give it to you, and you must learn to bear it all, not bear it alone, but be better for the wisdom that may come to you if you watch and listen and learn. Do not forget the turtle, nor the ways of men. They are all orphans and they go astray; they do wrong things. Try to see better."

"Yes, papa," I said, and that was how I believe I came to study men, not the men of written history but the ancestors beyond, beyond all writing, beyond time as we know it, beyond human form as it is known today. Papa was right when he told me men were orphans, eternal seekers. They had little in the way of instinct to instruct them, they had come a strange far road in the universe, passed more than one black, threatening bridge. There were even more to pass, and each one became more dangerous as our knowledge grew. Because man was truly an orphan and confined to no single way of life, he was, in essence, a prison breaker. But in ignorance his very knowledge sometimes led from one terrible prison to another. Was the final problem then, to escape himself, or, if not that, to reconcile his devastating intellect with his heart? All of the knowledge set down in great books directly or indirectly affects this problem. It is the problem of every man, for even the indifferent man is making, unknown to himself, his own callous judgment.

Long ago, however, in one of the Dead Sea Scrolls hidden in the Judaeen Desert, an unknown scribe had written: "None there be, can rehearse the whole tale." That phrase, too, contains the warning that man is an orphan of uncertain beginnings and an indefinite ending. All that the archaeological and anthropological sciences can do is to place a somewhat flawed crystal before man and say: This is the way you came, these are your present dangers; somewhere, seen dimly beyond, lies your destiny. God help you, you are a cosmic orphan, a symbol-shifting magician, mostly immature and inattentive to your own dangers. Read, think, study, but do not expect this to save you without humility of heart. This the old ones knew long ago in the great deserts under the stars. This they sought to learn and pass on. It is the only hope of men.

What have we observed that might be buried as the Dead Sea Scrolls were buried for 2,000 years, and be broken out of a jar for human benefit, brief words that might be encompassed on a copper scroll or a ragged sheet of vellum? Only these thoughts, I think, we might reasonably set down as true, now and hereafter. For a long time, for many, many centuries, Western man believed in what we might call the existent world of nature; form as form was

seen as constant in both animal and human guise. He believed in the instantaneous creation of his world by the Deity; he believed its duration to be very short, a stage upon which the short drama of a human fall from divine estate and a redemption was in progress.

Worldly time was a small parenthesis in eternity. Man lived with that belief, his cosmos small and man-centred. Then, beginning about 350 years ago, thoughts unventured upon since the time of the Greek philosophers began to enter the human consciousness. They may be summed up in Francis Bacon's dictum: "This is the foundation of all. We are not to imagine or suppose, but to *discover*, what nature does or may be made to do."

When in following years scientific experiment and observation became current, a vast change began to pass over Western thought. Man's conception of himself and his world began to alter beyond recall. "'Tis all in pieces, all coherence gone," exclaimed the poet John Donne, Bacon's contemporary. The existing world was crumbling at the edges. It was cracking apart like an ill-nailed raft in a torrent—a torrent of incredible time. It was, in effect, a new nature comprising a past embedded in the present and a future yet to be.

First, Bacon discerned a *mundus alter*, another separate world that could be drawn out of nature by human intervention—the world that surrounds and troubles us today. Then, by degrees, time depths of tremendous magnitude began, in the late 18th century, to replace the Christian calendar. Space, from a surrounding candelabrum of stars, began to widen to infinity. The Earth was recognized as a mere speck drifting in the wake of a minor star, itself rotating around an immense galaxy composed of innumerable suns. Beyond and beyond, into billions of light years, other galaxies glowed through clouds of wandering gas and interstellar dust. Finally, and perhaps the most shocking blow of all, the natural world of the moment proved to be an illusion, a phantom of man's short lifetime. Organic novelty lay revealed in the strata of the Earth. Man had not always been here. He had been preceded, in the 4,000,000,000 years of the planet's history, by floating mollusks, strange fern forests, huge dinosaurs, flying lizards, giant mammals whose bones lay under the dropped boulders of vanished continental ice sheets.

The Orphan cried out in protest, as the cold of naked space entered his bones, "Who am I?" And once more science answered. "You are a changeling. You are linked by a genetic chain to all the vertebrates. The thing that is you bears the still aching wounds of evolution in body and in brain. Your hands are made-over fins, your lungs come from a creature gasping in a swamp, your femur has been twisted upright. Your foot is a reworked climbing pad. You are a rag doll sewn from the skins of extinct animals. Long ago, 2,000,000 years perhaps, you were smaller, your brain was not so large. We are not confident that you could speak. Seventy million years before that you were an even smaller climbing creature known as a tupaiid. You were the size of a rat. You ate insects. Now you fly to the Moon."

"This is a fairy tale," protested the Orphan. "I am here, I will look in the mirror."

"Of course it is a fairy tale," said the scientists, "but so is the world and so is life. That is what makes it true. Life is

indefinite departure. That is why we are all orphans. That is why you must find your own way. Life is not stable. Everything alive is slipping through cracks and crevices in time, changing as it goes. Other creatures, however, have instincts that provide for them, holes in which to hide. They cannot ask questions. A fox is a fox, a wolf is a wolf, even if this, too, is illusion. You have learned to ask questions. That is why you are, an orphan. *You are the only creature in the universe who knows what it has been.* Now you must go on asking questions while all the time you are changing. You will ask what you are to become. The world will no longer satisfy you. You must find your way, your own true self."

"But how can I?" wept the Orphan, hiding his head. "This is magic. I do not know what I am. I have been too many things."

"You have indeed," said all the scientists together. "Your body and your nerves have been dragged about and twisted in the long effort of your ancestors to stay alive, but now, small orphan that you are, you must know a secret, a secret magic that nature has given to you. No other creature on the planet possesses it. You use language. You are a symbol-shifter. All this is hidden in your brain and transmitted from one generation to another. You are a time-binder, in your head the symbols that mean things in the world outside can fly about untrammelled. You can combine them differently into a new world of thought or you can also hold them tenaciously throughout a lifetime and pass them on to others."

Thus out of words, a puff of air, really, is made all that is uniquely human, all that is new from one human generation to another. But remember what was said of the wounds of evolution. The brain, parts of it at least, is very old, the parts laid down in sequence like geological strata. Buried deep beneath the brain with which we reason are ancient defense centres quick to anger, quick to aggression, quick to violence, over which the neocortex, the new brain, strives to exert control. Thus there are times when the Orphan is a divided being striving against himself. Evil men know this. Sometimes they can play upon it for their own political advantage. Men crowded together, subjected to the same stimuli, are quick to respond to emotion that in the quiet of their own homes they might analyze more cautiously.

Scientists have found that the very symbols which crowd our brains may possess their own dangers. It is convenient for the thinker to classify an idea with a word. This can sometimes lead to a process called hypostatization or reification. Take the word "Man," for example. There are times when it is useful to categorize the creature briefly, his history, his embracing characteristics. From this, if we are not careful of our meanings, it becomes easy to speak of all men as though they were one person. In reality men have been seeking this unreal man for thousands of years. They have found him bathed in blood, they have found him in the hermit's cell, he has been glimpsed among innumerable messiahs, or in meditation under the sacred bô tree; he has been found in the physician's study or lit by the satanic fires of the first atomic explosion.

In reality he has never been found at all. The reason is very simple: men have been seeking Man capitalized, an imaginary creature constructed out of disparate parts in

the laboratory of the human imagination. Some men may thus perceive him and see him as either totally beneficent or wholly evil. They would be wrong. They are wrong so long as they have vitalized this creation and call it "Man." There is no Man; there are only men: good, evil, inconceivable mixtures marred by their genetic makeup, scarred or improved by their societal surroundings. So long as they live they are *men*, multitudinous and unspent potential for action. Men are great objects of study, but the moment we say "Man" we are in danger of wandering into a swamp of abstraction.

Surveying our fossil history perhaps we are not even justified as yet in calling ourselves true men. The word carries subtle implications that extend beyond us into the time stream. If a remote half-human ancestor, barely able to speak, had had a word for his kind, as very likely he did, and just supposing it had been "man," would we approve the usage, the shape-freezing quality of it, now? I think not. Perhaps no true orphan would wish to call himself anything but a traveler. Man in a cosmic timeless sense may not be here.

The point is particularly apparent in the light of a recent and portentous discovery. In 1953 James D. Watson and Francis H.C. Crick discovered the structure of the chemical alphabet out of which all that lives is constituted. It was a strange spiral ladder within the cell, far more organized and complicated than 19th-century biologists had imagined; the tiny building blocks constantly reshuffled in every mating had both an amazing stability and paradoxically, over long time periods, a power to alter the living structure of a species beyond recall. The thing called man had once been a tree shrew on a forest branch; now it manipulates abstract symbols in its brain from which skyscrapers rise, bridges span the horizon, disease is conquered, the Moon is visited.

Molecular biologists have begun to consider whether the marvelous living alphabet which lies at the roof of evolution can be manipulated for human benefit. Already some varieties of domesticated plants and animals have been improved. Now at last man has begun to eye his own possible road into the future. By delicate excisions and intrusions could the mysterious alphabet we carry in our bodies be made to hasten our advancement into the future? Already our urban concentrations, with all their aberrations and faults, are future-oriented. Why not ourselves? It is in our power to perpetuate great minds *ad infinitum*? But who is to judge? Who is to select this future man? There is the problem. Which of us poor orphans by the roadside, even

those peering learnedly through the electron microscope, can be confident of the way into the future? Could the fish unaided by nature have found the road to the reptile, the reptile to the mammal, the mammal to man? And how was man endowed with speech? *Could* men choose their way? Suddenly before us towers the blackest, most formidable bridge of our experience. Across what chasm does it run?

Biologists tell us that in the fullness of time more than ninety percent of the world's past species have perished. The mammalian ones in particular are not noted for longevity. If the scalpel, the excising laser ray in the laboratory, were placed in the hands of some one person, some one poor orphan, what would he do? If assured, would he reproduce himself alone? If cruel, would he by indirection succeed in abolishing the living world? If doubtful of the road, would he reproduce the doubt? "Nothing is more shameful than assertion without knowledge," the great Roman statesman and orator Cicero once pronounced as though he had foreseen this final bridge of human pride—the pride of a god without foresight.

After the disasters of the second World War when the dream of perpetual progress died from men's minds, an orphan of this violent century wrote a poem about the great extinctions revealed in the rocks of the planet. It concludes as follows:

I am not sure I love
the cruelties found in our blood
from some lost evil tree in our beginnings.
May the powers forgive and seal us deep
when we lie down,
May harmless dormice creep and red leaves fall
over the prisons where we wreaked our will.
Dachau, Auschwitz, those places everywhere.
If I could pray, I would pray long for this.

One may conclude that the poet was a man of doubt. He did not regret man; he was confident that leaves, rabbits, and songbirds would continue life, as, long ago, a tree shrew had happily forgotten the ruling reptiles. The poet was an orphan in shabby circumstances pausing by the roadside to pray, for he did pray despite his denial; God forgive us all. He was a man in doubt upon the way. He was the eternal orphan of my father's story. Let us then, as similar orphans who have come this long way through time, be willing to assume the risks of the uncompleted journey. We must know, as that forlorn band of men in Judaea knew when they buried the jar, that man's road is to be sought beyond himself. *No man there is who can tell the whole tale.* After the small passage of 2,000 years who would deny this truth?

Part Four. Human Life

The outlines in the three divisions and fifteen sections of Part Four treat stages in the development of human life on Earth; human health and diseases; and human behaviour and experience.

Several points should be noted about the relations of Part Four to preceding and subsequent parts.

The fundamental physical and chemical properties of matter are dealt with in Part One. The treatment of the Earth in Part Two encompasses those properties of the Earth that are supportive of human life. Much fundamental biological knowledge concerning human life is involved in the treatment—in Part Three, *Life on Earth*—of what is common to all animal life; the last section of Part Three deals with mankind's place in the biosphere.

Knowledge of the biomedical and psychological aspects of human life is not wholly separable from, and is germane to, the subjects covered in Parts Five through Ten, which treat human society, the fine arts, technology, religion, the history of peoples and civilizations, and man as logician, mathematician, scientist, historian, and philosopher.

The biological, medical, and psychological sciences have been themselves the object of historical and analytical studies concerned with their nature, methods, and interrelations. These studies are set forth in Sections 10/34, 10/35, and 10/36 of Part Ten. The instrumentation involved in these sciences is dealt with in Section 723 of Part Seven.

Division I. Stages in the Development of Human Life on Earth 143

II. The Human Organism: Health and Disease 146

III. Human Behaviour and Experience 159

Division I. Stages in the Development of Human Life on Earth

The outlines in the two sections of Division I present studies in historical comparative anatomy that place *Homo sapiens* within a general taxonomy; the theory of human evolution; and studies, in genetics and physical anthropology, of human heredity and the races of mankind.

Section 411. Human Evolution 143

412. Human Heredity: the Races of Mankind 145

Section 411. Human Evolution

A. The evolutionary process

B. Human evolutionary relationships with living and fossil primates

1. The primates

a. Distinguishing characteristics of the primates

b. The natural history of primate life

c. Evolution and paleontology

d. Classification of the primates: the two main groups or suborders, the prosimians (principally lemurs, lorises, and tarsiers) and the anthropoids (monkeys, apes, and man)

[see also 313.F.25.c.]

2. Distinguishing characteristics of the Hominidae

a. Morphological characteristics

b. Inferred behavioral characteristics

c. Contrasting adaptations of Hominidae and Pongidae

C. The fossil record of the Hominidae

1. The discovery and recognition of the hominid fossil record

2. Classification of the Hominidae

- a. *Australopithecus*
- b. *Homo habilis*
- c. *Homo erectus*
- d. *Homo sapiens*
 - i. Fossil remains of early *Homo sapiens*; e.g., Vértesszöllös man, Ngeloba man, Border Cave man, Swanscombe man, Omo hominids
 - ii. The Neanderthals
 - iii. The Cro-Magnons
 - iv. *Homo sapiens* of Africa
 - v. *Homo sapiens* of Asia and Australasia

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with human evolution

Evolution, Human
Life

MICROPAEDIA: Selected entries of reference information

General subjects

<i>cultural stages:</i>	Lantian man	<i>tools and tool</i>	Magdalenian
Mesolithic Period	Makapansgat	<i>industries:</i>	culture
Neolithic Period	Olduvai Gorge	Abbevillian	Maglemosian
Paleolithic Period	Omo remains	industry	industry
<i>hominid fossils:</i>	Peking man	Acheulean industry	Mousterian
Amud remains	Petralona skull	Aterian industry	industry
Chad	Pitldown man	Aurignacian	Oldowan industry
australopithecine	Ramapithecus	culture	Osteodontokeratic
Chancelade	Saccopastore skulls	Azilian industry	tool industry
skeleton	Sterkfontein	Chopper	Perigordian
Ferassie	Swanscombe skull	chopping-tool	industry
skeletons, La	Telanthropus	industry	Solutrean industry
Hadar remains	capensis	Clactonian	Stillbay industry
Heidelberg jaw	<i>hominids:</i>	industry	stone-tool industry
Iceman	Australopithecus	Ertebølle industry	<i>other:</i>
Java man	Cro-Magnon	Fauresmith	evolution
Kabwe man	hominid	industry	Gigantopithecus
Kafzeh	<i>Homo erectus</i>	flake tool	human evolution
Kanapoi fossil	<i>Homo habilis</i>	Ibero-Maurusian	missing link
Koobi Fora	<i>Homo sapiens</i>	industry	
remains	<i>Homo</i>	Levalloisian	
Krapina remains	transvaalensis	stone-flaking	
Laetolil remains	Neanderthal	techniques	

Biographies

See Section 10/36 of Part Ten

INDEX: See entries under all of the terms above

Section 412. Human Heredity**A. Heredity in humans**

1. The biological basis of human heredity: genetic reproduction
2. Inheritance of behavioral traits
 - a. Fraternal and identical twins and the inferences that can be made from twin studies
 - b. Genetic explanations for abnormalities: chromosome variations, mutation
3. Applications of human genetics
4. Specific behavioral traits affected by inheritance
5. Consanguinity and its effects

B. The nature and origin of human physical variation

1. Aspects of human diversity
2. Measures of "race"
 - a. Old measures; *e.g.*, colour, hair form, body measurements, features such as eyes and nose
 - b. Modern measures; *e.g.*, blood groups and genetic evidence

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with human heredity: the races of mankind

Evolution, Human
Genetics and Heredity, The Principles of
Life

MICROPAEDIA: Selected entries of reference information

General subjects

<i>human heredity</i> :	consanguinity	founder principle	pedigree
assortative mating	dominance	genetic drift	recessiveness
character	eugenics	heterospecific	
climatic adaptation		mating	

Biographies

See Sections 10/34 and 10/36 of Part Ten

INDEX: See entries under all of the terms above

Division II. The Human Organism: Health and Disease

[For Part Four headnote see page 143.]

The outlines in the four sections of Division II treat the structures and functions of the human body; human health; the manifestation, recognition, and treatment of human disease; and the practice of medicine.

The outline referred to in Section 421 deals with the structures and the functions of the several organ systems, the proper coordination and regulation of which constitute the health of the human body.

The outline in Section 422 begins with an enumeration of the stages in human life and the definitions of normality in human health. It then treats of the various ways that the body maintains itself and recovers from injury. The Section concludes with a listing of other significant influences on human health.

The outline in Section 423 first treats the general characteristics, causes, and classifications of human disease. It then treats the concepts, principles, and methods of the medical art, in the two stages of diagnosis and therapy. The outline encompasses the symptoms, diagnosis, and treatment of diseases that affect the body as a whole, and of diseases that affect each of the organ systems dealt with in their healthy state in Section 421.

The outline in Section 424 deals with issues relating to the professionalization of the practice of medicine—not only those internal to the profession but also those arising from the educational, economic, social, political, and legal dimensions of institutionalized medicine.

Section 421. The Structures and Functions of the Human Body 146

422. Human Health 150

423. Human Diseases 151

424. The Practice of Medicine and the Care of Health 158

Section 421. The Structures and Functions of the Human Body

- A. The structures and functions of the cardiovascular system
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 2. The blood vessels: arteries, veins, and capillaries
 3. Human blood
 - a. Components of blood: plasma, red blood cells (erythrocytes), white blood cells (leukocytes), platelets (thrombocytes)
 - b. Blood groups
 - c. Bleeding and blood clotting
 4. Blood circulation: the central pump, the systemic circulation, the pulmonary circulation
- B. The structures and functions of the lymphatic system: lymphocytes, lymphatic vessels, lymph nodes, and the lymph
- C. The structures and functions of the respiratory system
 1. The upper portion of the respiratory tract: nasal cavity, pharynx, larynx, and trachea
 2. The lungs and bronchi
 3. The regulation, control, and dynamics of breathing
- D. The structures and functions of the digestive system
 1. Structure of the components of the digestive tract
 - a. Mouth and related structures
 - b. Pharynx and esophagus
 - c. Stomach
 - d. The small intestine and the small bowel mucosa
 - e. Large intestine, rectum, and anus
 - f. Associated glands and structures: pancreas, liver, gallbladder, and bile ducts
 2. The digestive process
- E. The structures and functions of the endocrine system

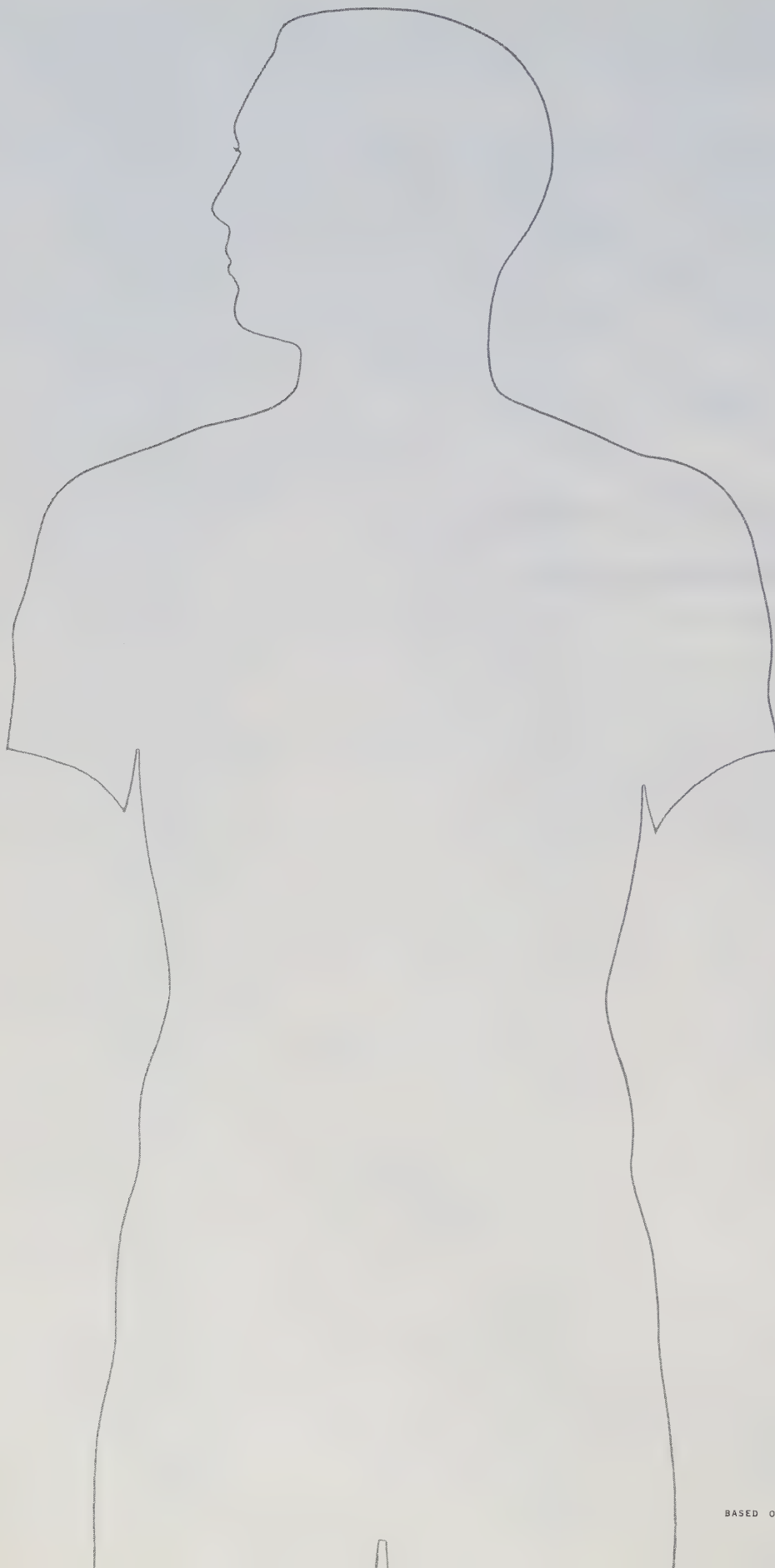
Principal Parts of THE HUMAN BODY

PLATE

This Plate on gross anatomy comprises 14 Views, 12 of which are transparent, showing all principal parts of the human anatomy. Below is a list in English (insofar as this is possible) of the names of the parts illustrated. The number immediately following the name is the code number for that part; the other number or numbers indicate the View or Views on which it is shown. A key to the Plate, with Latin names, is given on the last page.

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Sinus, straight, 155: 12, 13
Sinus, superior sagittal, 157: 12, 13
Skull, 33: 2
Sphenoid bone, 132: 7
Spinal cord, 64: 7, 14
Spleen, 52: 5, 12, 13
Splenic artery, 13: 5
Splenic vessels, 172: 12, 13
Sternohyoid muscle, 103: 1, 2, 9
Sternomastoid muscle, 102: 1, 2, 8, 9, 10
Sternothyroid muscle, 104: 2, 9
Stomach, 196: 3, 4, 10, 11
Styloglossus muscle, 105: 3
Subclavian artery, 18: 5, 6, 14
Subclavian vein, 195: 3, 4, 10, 11
Submandibular gland, 43: 1, 2
Suprarenal gland, 44: 5, 6, 14
Temporal bone, 133: 3, 7
Temporal muscle, 106: 1
Tensor fasciae latae muscle, 107: 1, 5, 6, 14
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Testicle, 162: 5
Testicular vessels, 176: 5, 6
Thoracic vessels, internal, 177: 9, 10
Thyrohyoid muscle, 108: 2
Thyroid cartilage, 21: 3
Thyroid gland, 45: 3, 4, 10, 11
Tongue, 60: 3, 4, 5, 6, 7, 11, 14
Transversus abdominis muscle, 109: 1, 2
Transversus thoracis muscle, 110: 2, 9
Trapezius muscle, 111: 5, 6, 10, 14
Triceps brachii muscle, 112: 5, 6, 14
Turbinate bones: see Nasal concha
Ulnar nerve, 120: 5, 6, 14
Umbilical fold, medial, 142: 9
Umbilical fold, median, 143: 9
Ureter, 166: 5, 6, 13, 14
Urinary bladder, 201: 3, 4, 5, 6, 12, 13
Uterus, 167: 14
Vagina, 168: 14
Vagus nerve, 121: 14
Vena cava, inferior, 181: 5, 6, 11, 14
Vena cava, superior, 182: 4, 5, 10, 11
Ventricle, left, 198: 5, 10, 11
Ventricle, right, 197: 5, 10, 11
Vertebra, 199: 6, 7, 11, 14
Windpipe, 163: 5, 6, 14
Womb: see Uterus
Zygomaticus major muscle, 113: 1, 10



A.— Arteria; L.— Ligamentum; M.— Musculus
N.— Nervus; V.— Vena

1

1. Anulus inguinalis profundus
2. Anulus inguinalis superficialis
4. Aponeurosis m. obliquus externus abdominis
24. Clavicula
42. Glandula parotis; ductus parotideus
43. Glandula submandibularis
46. Glans penis
54. L. fundiforme penis
55. L. inguinale
57. Linea alba; umbilicus
59. Linea semilunaris
61. Mandibula
69. M. biceps brachii
72. M. buccinator
74. M. deltoideus
75. M. depressor anguli oris
79. M. gluteus medius
83. M. intercostalis externus
85. M. masseter
87. M. obliquus externus abdominis
88. M. obliquus internus abdominis
89. M. omohyoideus
90. M. orbicularis oris
91. M. pectoralis major
97. M. quadriceps femoris (rectus)
98. M. rectus abdominis
99. M. sartorius
101. M. serratus anterior
102. M. sternocleidomastoideus
103. M. sternohyoideus
106. M. temporalis
107. M. tensor fasciae latae
109. M. transversus abdominis
111. M. trapezius
112. M. triceps brachii
113. M. zygomaticus major
117. N. medianus
125. Os costale
129. Os parietale
134. Os zygomaticum
151. Scrotum
159. Spina iliaca anterior superior
160. Sternum
179. V. comitantes
a. brachialis
184. V. femoralis



A.— Arteria; L.— Ligamentum; M.— Musculus
N.— Nervus; V.— Vena

8

- 24. Clavicula
- 40. Fossa ovalis
- 55. L. inguinale
- 57. Linea alba; umbilicus
- 59. Linea semilunaris
- 74. M. deltoideus
- 75. M. depressor anguli oris
- 87. M. obliquus externus abdominis
- 91. M. pectoralis major
- 102. M. sternocleidomastoideus
- 113. M. zygomaticus major
- 120. N. ulnaris
- 139. Platysma
- 159. Spina iliaca anterior superior
- 160. Sternum
- 169. Vasa epigastrica inferiora
- 179a. V. basilica (brachii)
- 183. V. cephalica
- 194. V. saphena magna



Principal Parts of THE HUMAN BODY

KEY TO PLATE, VIEWS 1-14

On the list below, the number at left is a code number for the part of the body named.
The number or numbers at right indicate the View or Views on which that part of the body is shown.

Abbreviations: A. (Arteria); L. (Ligamentum); M. (Musculus); N. (Nervus); and V. (Vena).

1. Annulus inguinalis profundus, 1,2
2. Annulus inguinalis superficialis, 1
3. Aorta, 5,6,10,11,14
4. Aponeurosis m. obliquus externus abdominis, 1
5. Appendix vermiformis, 4,12,13
6. A. axillaris, 5,6,14
7. A. brachialis, 5,6,14
8. A. carotis communis, 5,14
9. A. femoralis, 5,6,14
10. A. iliaca communis, 5,6,14
11. A. iliaca externa, 5,6,14
12. A. iliaca interna, 5,6,14
13. A. lienalis (a. splenica), 5
14. A. mesenterica inferior, 5,6,14
15. A. mesenterica superior, 14
16. A. pulmonalis, 5,10,11,14
17. A. renalis, 6,14
 A. splenica: see 13
18. A. subclavia, 5,6,14
19. Atrium sinistrum, 11
20. Bronchus principalis, 5,14
21. Cartilago thyroidea, 3
22. Cerebellum, 11,14
23. Cerebrum, 11,14
24. Clavicula, 1,2,7,8,9,14
25. Colon ascendens, 3,4,12,13
26. Colon descendens, 3,4,12,13
27. Colon sigmoideum, 3,4,12,13
28. Colon transversum, 3,4,11
29. Concha nasalis inferior, 4,7,11,14
30. Concha nasalis media, 4,7,11,14
31. Concha nasalis superior, 4,7,11,14
 Cor (heart): see 19,138,197,198
32. Corpus callosum, 11,14
33. Cranium, 2
34. Diaphragma, 2,3,4,5,6,9,10,11,14
35. Ductus choledochus, 4,5,10,11,13
36. Ductus deferens, 5,6
37. Duodenum, 5,12,13
 Esophagus: see 122
38. Falx cerebri, 12,13
39. Femur, 7
40. Fossa ovalis (hiatus saphenus), 8
 Gall Bladder: see 200
 Gaster: see 196
41. Glandula lacrimalis, 2
42. Glandula parotidea, 1,2
43. Glandula submandibularis, 1,2
44. Glandula suprarenalis, 5,6,14
45. Glandula thyroidea, 3,4,10,11
46. Glans penis, 1
 Heart: see 19,138,197,198
47. Hepar (liver), 3,4,9,10,11
 Hiatus saphenus: see 40
48. Humerus, 7
49. Ileum, 12
50. Intestinum tenue, 3,4,10,11
 Kidney: see 149
51. Larynx, 4,7,11,14
52. Lien (splen; spleen), 5,12,13
53. L. falciforme hepatis, 3,9
54. L. fundiforme penis, 1
55. L. inguinale, 1,2,3,5,6,8,13,14
56. L. teres hepatis, 2,9
57. Linea alba, 1,2,8
58. Linea arcuata, 2
59. Linea semilunaris, 1,2,8,9
60. Lingua (tongue), 3,4,5,6,7,11,14
 Liver: see 47
 Lung: see 146
61. Mandibula, 1,2,3,4,5,6,7,11,14
62. Maxilla, 2,3,4,5,6,7,11,12,13,14
63. Medulla oblongata, 11,14
64. Medulla spinalis, 7,14
65. Mesenterium, 4, 11, 12
66. Mesocolon transversum, 11,12
67. M. adductor brevis, 7
68. M. adductor longus, 6,7,14
69. M. biceps brachii, 5,6,10,11
70. M. brachialis, 14
71. M. brachioradialis, 12,13,14
72. M. buccinator, 1
73. M. coracobrachialis, 5,14
74. M. deltoideus, 5,6,8,9,14
75. M. depressor anguli oris, 1,10
76. M. digastricus, 3
77. M. extensor carpi radialis longus, 14
78. M. flexor carpi radialis, 14
79. M. gluteus medius, 1,5,6,7,14
80. M. gluteus minimus, 7
81. M. gracilis, 6,7,14
82. M. iliacus, 7,14
83. M. intercostalis externus, 1
84. M. intercostalis internus, 2,9
85. M. masseter, 1
86. M. mylohyoideus, 2,3
87. M. obliquus externus abdominis, 1,8
88. M. obliquus internus abdominis, 1
89. M. omohyoideus, 1,2,9
90. M. orbicularis oris, 1
91. M. pectoralis major, 1,2,5,8,9,14
92. M. pectoralis minor, 2,5,9,10,11
93. M. pronator teres, 14
94. M. psoas major, 7,14
95. M. pterygoideus medialis, 2
96. M. quadratus lumborum, 14
97. M. quadriceps femoris, 3,4,5,6,14
98. M. rectus abdominis, 1,2
99. M. sartorius, 1,2,9
100. M. scalenus anterior, 14
101. M. serratus anterior, 1
102. M. sternocleidomastoideus, 1,2,8,9,10
103. M. sternohyoideus, 1,2,9
104. M. sternothyroideus, 2,9
105. M. styloglossus, 3
106. M. temporalis, 1
107. M. tensor fasciae latae, 1,5,6,14
108. M. thyrohyoideus, 2
109. M. transversus abdominis, 1,2
110. M. transversus thoracis, 2,9
111. M. trapezius, 5,6,10,14
112. M. triceps brachii, 5,6,14
113. M. zygomaticus major, 1,10
114. N. femoralis, 7,14
115. N. iliohypogastricus, 7
116. N. ilio-inguinalis, 7
117. N. medianus, 5,6,14
118. N. obturatorius, 7
119. N. phrenicus, 10
120. N. ulnaris, 5,6,14
121. N. vagus, 14
122. Oesophagus (esophagus), 5,6,12,13,14
123. Omentum majus, 10
124. Omentum minus, 3,4,9,10,11
125. Os costate, 1,2,7,9
126. Os frontale, 3,7
127. Os ischii, 7
128. Os occipitale, 4,5,7
129. Os parietale, 3,7
130. Os pubis, 3,6,7,13,14
131. Os sacrum, 7
132. Os sphenoidale, 7
133. Os temporale, 3,7
134. Os zygomaticum, 1
135. Ovarium (ovary), 14
136. Pancreas, 5,12,13
137. Penis, 2,3,5
138. Pericardium, 10
139. Platysma, 8,9
140. Plexus brachialis, 5,6,7,14
141. Plexus lumbosacralis, 7
142. Plica umbilicalis medialis, 9
143. Plica umbilicalis mediana, 9
144. Pons, 11,14
145. Prostata, 6
146. Pulmo (lung), 3,4,5,6,10,11,14
147. Pylorus, 12,13
148. Rectum, 7, 14
149. Ren (kidney), 5,6,14
150. Scapula, 7
151. Scrotum, 1,2,5
152. Septum nasi, 5,6,12,13
153. Sinus frontalis, 2,3,4,5,6,7,11,12,13,14
154. Sinus maxillaris, 2,3
155. Sinus rectus, 12,13
156. Sinus sagittalis inferior, 12,13
157. Sinus sagittalis superior, 12,13
158. Sinus sphenoidalis, 4,5,6,7,11,12,13,14
159. Spina iliaca anterior superior, 1,2,7,8,14
 Spleen: see 52
 Splén: see 52
160. Sternum, 1,2,8,9
 Stomach: see 196
161. Tentorium cerebelli, 11,14
 Tongue: see 60
162. Testis, 5
163. Trachea, 5,6,14
164. Truncus brachiocephalicus, 5,14
165. Truncus coeliacus, 5,10,12,14
166. Ureter, 5,6,13,14
167. Uterus, 14
168. Vagina, 14
169. Vasa epigastrica inferior, 5,8,9
170. Vasa gastrica, 11
171. Vasa gastro-omentalis, 10
172. Vasa lienalis (vasa splenica), 12,13
173. Vasa mesenterica inferior, 12,13
174. Vasa mesenterica superior, 5,12,13
175. Vasa ovarica, 14
 Vasa splenica: see 172
176. Vasa testicularis, 5,6
177. Vasa thoracica interna, 9,10
178. V. axillaris, 3,10,11
179. V. comitans a. brachialis, 3,8,10,11
180. V. brachiocephalica, 3,4,10,11
181. V. cava inferior, 5,6,11,14
182. V. cava superior, 4,5,10,11
183. V. cephalica, 3,4,8,9,11,12,13,14
184. V. femoralis, 5,6,14
185. V. iliaca communis, 5,6,14
186. V. iliaca externa, 5,6,14
187. V. iliaca interna, 5,6,14
188. V. jugularis interna, 3,4,5,10
189. V. mesenterica inferior, 13
190. V. mesenterica superior, 5
191. V. portae hepatis, 5,11,12,13
192. V. pulmonalis, 11,14
193. V. renalis, 6,14
194. V. saphena magna, 8,9
195. V. subclavia, 3,4,10,11
196. Ventriculus (gaster; stomach), 3,4,10,11
197. Ventriculus dexter, 5,10,11
198. Ventriculus sinister, 5,10,11
199. Vertebra, 6,7,11,14
200. Vesica biliaris (vesica fellea; gall bladder), 3,4,10,11
201. Vesica urinaria, 3,4,5,6,12,13
202. Vesicula seminalis, 6

1. The glands and tissues making up the system and their secretions
 - a. The thyroid
 - b. The adrenal glands
 - c. The pituitary
 - d. Hypothalamus
 - e. Pancreatic islets
 - f. Parathyroid glands
 - g. Gastrointestinal mucosa
 - h. Thymus, pineal gland, kidneys, and other possible endocrine organs or hormones
 2. The effects of the endocrine system upon reproductive processes
[see also F., below]
 - a. Glands affected by endocrine secretions: the testes, the ovaries, the placenta
 - b. Female processes under endocrine control: the menstrual cycle, gestation, parturition, the secretion of milk, and the termination of menstrual life
- F. The structures and functions of the reproductive system
1. The male reproductive system
 2. The female reproductive system
- G. The structures and functions of the excretory system
1. The structures: kidneys, ureters, urinary bladder, urethra
 2. The excretory process
- H. The structures and functions of the supportive-protective system
1. The composition and properties of bone
 2. The connective tissues
 3. The joints
 4. The bursae
 5. The sinuses
 6. The muscular system
 7. The structure and properties of muscle
 - a. Striated, skeletal, or voluntary muscle
 - b. Nonstriated, smooth, or involuntary muscle
 - c. Cardiac muscle
 - d. The contraction of muscle fibres
[see 323.D.]
 8. The integument and derivatives: skin, hair, and nails
- I. The body cavities and their membranes: the thoracic cavity, the abdominal cavity
- J. The structure and functions of the nervous system
1. The central nervous system: the brain and spinal cord, the cerebrospinal fluid
 2. The peripheral nervous system: cranial nerves, spinal nerves, and that part of the autonomic system that is outside the brain and spinal cord
 3. The autonomic nervous system: the sympathetic and parasympathetic systems
 4. The eye and the process of vision
 5. The ear and the process of audition
 6. Other sensory receptors
 - a. Cutaneous (skin) senses: touch, heat, cold, and pain
 - b. Kinesthetic (motion) sense
 - c. Vestibular sense (equilibrium): acceleration, rotation, orientation, and balance

d. Taste (gustatory) sense

e. Smell (olfactory) sense

K. The composition and properties of body fluids and tissues

[see 332.D.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the structures and functions of the human body

Biochemical Components of Organisms Blood Circulation and Circulatory Systems	Digestion and Digestive Systems Endocrine Systems Excretion and Excretory Systems Integumentary Systems	Muscles and Muscle Systems Nerves and Nervous Systems Nutrition Reproduction and Reproductive Systems	Respiration and Respiratory Systems Sensory Reception Supportive and Connective Tissues
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MICROPAEDIA: Selected entries of reference information

General subjects

<i>bones and skeletal system:</i> bone bone marrow cartilage joint osteoblast osteoclast osteocyte osteon periosteum skeleton	<i>cardiovascular system—heart:</i> atrium coronary circulation diastole heart systole ventricle	cecum chewing chyme colon defecation digestion duodenum esophagus feces flatulence gallbladder gastric gland ileum intestinal gas large intestine liver pancreas Paneth's cell peristalsis pharynx plica circularis pylorus rectum small intestine stomach swallowing villus	follicle-stimulating hormones gastrin glucagon growth hormone hormone insulin Langerhans, islets of luteinizing hormone neurohormone ovary oxytocin parathyroid gland pineal gland pituitary gland progesterone prolactin relaxin renin steroid hormone testis testosterone thymus thyroid gland
<i>cardiovascular system—blood:</i> ABO blood group system agglutinin blood blood cell formation blood typing coagulation complement erythrocyte hemoglobin hemolysis leukocyte lymphocyte plasma platelet Rh blood-group system serum albumin	<i>cardiovascular system—other:</i> blood pressure cardiovascular system pulmonary circulation pulse systemic circulation	<i>endocrine system:</i> adrenal gland adrenocorticotrophic hormone androgen calcitonin corticoid endocrine system enterogastrone epinephrine and norepinephrine estrogen	<i>excretory system:</i> excretion kidney loop of Henle renal artery renal capsule renal collecting tubule renal pelvis renal pyramid ureter urethra urinary bladder
<i>cardiovascular system—blood vessels:</i> aorta artery capillary vein vena cava	<i>cavities and membranes:</i> abdominal cavity peritoneum pleura sinus thoracic cavity <i>connective tissues:</i> collagen connective tissue elastic fibre ligament mast cell reticular fibre tendon <i>digestive system:</i> anal canal anus argentaffin cell bile bilirubin		

urination	biceps muscle	external auditory	uterus
urine	extensor muscle	canal	vagina
<i>integument and its</i>	flexor muscle	inner ear	vulva
<i>derivatives:</i>	gluteus muscle	sound reception	<i>reproductive</i>
dermis	iliocostalis muscle	tympanic	<i>system—male:</i>
epidermis	latissimus dorsi	membrane	bulbourethral
hair	levator muscle	vestibulocochlear	gland
mammary gland	muscle	nerve	ductus deferens
nail	pectoralis muscle	<i>nervous system—eye</i>	ejaculation
perspiration	sphincter muscle	<i>and vision:</i>	epididyme
sebaceous gland	<i>nervous system—</i>	aqueous humour	erection
sweat gland	<i>autonomic:</i>	cone	penis
<i>lymphatic system:</i>	adrenergic nerve	eye	prostate gland
adenoids	fibre	eyelid	scrotum
lymph	autonomic nervous	focusing	semen
lymph node	system	iris	seminal vesicle
lymph nodule	cranial nerve	lens	sperm
lymphoid tissue	facial nerve	macula lutea	spermatic cord
Peyer's patch	ganglion	optic nerve	spermatogenesis
spleen	spinal nerve	retina	testis
thymus	vagus nerve	rhodopsin	<i>reproductive</i>
tonsil	<i>nervous system—</i>	rod	<i>system—other:</i>
<i>mouth, teeth, and</i>	<i>central:</i>	tear duct and	artificial
<i>gums:</i>	brain	gland	insemination
canine tooth	cerebellum	<i>nervous system—</i>	orgasm
cementum	cerebral cortex	<i>other:</i>	placenta
dentine	cerebral fissure	nervous system	sexual intercourse
enamel	cerebrospinal fluid	neuron	umbilical cord
gum	cerebrum	neurotransmitter	<i>respiratory system:</i>
mouth	hypothalamus	proprioception	diaphragm
palate	laterality	smell	larynx
periodontal	medulla oblongata	taste	lung
membrane	meninges	<i>reproductive</i>	nose
permanent tooth	pons	<i>system—female:</i>	pulmonary
premolar	spinal cord	clitoris	alveolus
primary tooth	thalamus	fallopian tube	respiration
saliva	<i>nervous system—ear</i>	menopause	trachea
salivary gland	<i>and hearing:</i>	menstruation	<i>other:</i>
tongue	auricle	oogenesis	bursa
tooth	bone conduction	ovary	human body
<i>muscles:</i>	ear	ovulation	mucus
abdominal muscle	eustachean tube	ovum	reticuloendothelial
abductor muscle		puerperium	system
adductor muscle		uterine cervix	

Biographies

See Section 10/34 of Part Ten

INDEX: See entries under all of the terms above

Section 422. Human Health**A. Stages in the human life cycle**

1. Fertilization: the beginning of life
[see also 331.E.]
2. Prenatal development
[see also 338.B.]
3. Birth
4. Postnatal development
[see also 338.B.]
5. Reproduction
[see also 337]
6. Aging
7. Dying and death

B. Definitions and ranges of normality in human health**C. Bodily mechanisms for the maintenance of human health during stress**

1. The maintenance of the internal environment and the adaptation of cells to severe stress
2. Defenses against disease
 - a. Maintenance of integrity of skin and mucosal linings
 - b. Role of the phagocytic cells of the body
 - c. Inflammation: the response to biological insult
 - d. The immune response
3. Role of the blood in the prevention of hemorrhage
4. Healing: the processes of regeneration and organization in the repair of tissues
5. The alarm reaction: preparation through the effects of certain hormones for either flight or resistance
[see 421.E.1.b.]

D. Other regimes affecting standard values in human health

1. Nutrition and diet
 - a. Functions of food
 - b. Classes of food
 - c. Recommended intakes of nutrients to meet standards of physiological and metabolic requirements
 - d. Feeding behaviour
 - e. Therapeutic diets
2. Exercise and physical conditioning
 - a. Exercise needs: maintenance of health, avoidance of exercise injuries, and assessment of exercise adequacy
 - b. Physiological responses to exercise and the effects of physical conditioning
3. The state of sleep and its effects
 - a. The nature of sleep: criteria for and problems in defining sleep
 - b. Psychophysiological variations in sleep; *e.g.*, REM, NREM, light and deep sleep, dreaming
 - c. Effects of general and selective sleep deprivation

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with human health

Death
 Exercise and Physical Conditioning
 Immunity
 Nutrition

MICROPAEDIA: Selected entries of reference information

General subjects

<i>baths and spas:</i>	<i>life cycle—prenatal:</i>	<i>protective</i>	reticuloendothelial
bath	embryo	<i>mechanisms of the</i>	system
furo	fertilization	<i>body:</i>	tumour necrosis
sauna	fetus	antibody	factor
spa	implantation	antigen	<i>other:</i>
Turkish bath	in vitro	coagulation	dieting
<i>exercise:</i>	fertilization	homeostasis	health
aerobics	pregnancy	human leukocyte	immunization
exercise	<i>life cycle—other:</i>	antigen	nutrition
jogging	adolescence	immunity	preventive
physical	adulthood	inflammation	medicine
education	aging	interferon	sleep
<i>life cycle—birth:</i>	death	interleukin	vegetarianism
natural childbirth	infancy	phagocytosis	
parturition	middle age		
presentation	old age		

Biographies

See Section 10/35 of Part Ten

INDEX: See entries under all of the terms above

Section 423. Human Diseases

- A. Characteristics, causes, and classifications of human disease
- B. The detection and diagnosis of disease
- C. The treatment of disease: therapeutics
 1. Aspects of medical treatment: factors for consideration in the formulation of a therapeutic regimen
 2. Major therapeutic techniques
 - a. Surgical treatment
 - b. Biological therapy
 - c. Pharmacodynamic therapy
 - d. Chemotherapy
 - e. Substitution therapy
 - f. Radiation therapy
 - g. Physical therapy
 - h. Occupational therapy
 - i. Shock therapy
 - j. Burn treatment
 - k. Organ and tissue transplants
 - l. Psychological therapy
[see 436.D.4.]

- D. The symptoms, diagnosis, and treatment of diseases of the body as a whole
 - 1. Physiological shock
 - 2. Metabolic diseases and disorders
 - 3. Nutritional diseases: disorders related to nutritional deficiencies and excesses
 - 4. Diseases and disorders of fluid and electrolyte balance
 - 5. Infectious or contagious diseases: the impairment of health by living invaders of the body
 - 6. Diseases and disorders present at the time of birth
 - 7. Childhood diseases
 - 8. Disorders and injuries caused by physical agents: electrical shock; exposure to extremes of temperature, radiation, and pressure; motion sickness; wounds
 - 9. Dehydration and associated disorders
 - 10. Poisoning
 - 11. Allergenic diseases and anaphylactic shock
- E. The symptoms, diagnosis, and treatment of diseases affecting any organ or tissue of the body: tumours and cancers, hyperplasia, atrophy
- F. Diseases of particular bodily systems
 - 1. The cardiovascular system
 - a. The heart and the great vessels
 - b. The blood vessels
 - c. Blood circulation
 - d. The blood and blood-forming tissues
 - 2. The lymphatic system
 - a. Disorders of lymphatic vessels and their drainage
 - b. Disorders of lymphoid tissue
 - 3. The respiratory system
 - a. Infectious diseases of the respiratory system
 - b. Allergic lung diseases
 - c. Bronchopulmonary diseases
 - d. Diseases of the nonpulmonary structures
 - e. Disorders in the dynamics of respiration
 - 4. The digestive system
 - a. The mouth, pharynx, and associated structures
 - b. The esophagus
 - c. The stomach and duodenum
 - d. The small intestine and appendix
 - e. The large intestine
 - f. The digestive glands
 - g. Disorders in the digestion and absorption of foods
 - 5. The endocrine system
 - a. The pituitary
 - b. The thyroid
 - c. The parathyroids
 - d. The adrenals
 - e. The gonads and placenta

- f. The pancreas
- g. Other endocrine glands: pineal gland, thymus
- 6. The reproductive system
 - a. Genetic and congenital abnormalities
 - b. Infections and sexually transmitted diseases
 - c. The male reproductive system
 - d. The female reproductive system
 - e. Pregnancy
- 7. The excretory system
[see also 10/35.B.1.d.]
 - a. Functional aspects: disorders of urine production and micturition
 - b. The kidneys and tubules
 - c. The urinary tract: ureters, bladder, and urethra
- 8. The supportive-protective system
 - a. The skeletal system and bone
 - b. Connective tissue: bone and periosteum, cartilage, tendon, and ligament
 - c. The joints
 - d. The bursae
 - e. The sinuses and the body cavities and their membranes
 - f. Muscle
 - g. The skin
- 9. The nervous system
[see also 10/35.B.1.f.]
 - a. Neurological manifestations secondary to other diseases, neurochemical disorders, and development defects
 - b. Disorders of the peripheral nerves
 - c. Disorders of the spinal cord and autonomic nervous system
 - d. Disorders of the central nervous system
 - e. Other disorders of the general nervous system
 - f. Disorders of the eye and vision
 - g. Disorders of the ear and hearing
 - h. Disorders of other sensory receptors
 - i. Disorders of speech
 - j. Headache

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with human diseases

Blood	Digestion and	Integumentary	Respiration and
Cancer	Digestive Systems	Systems	Respiratory
Childhood	Disease	Metabolism	Systems
Diseases and	Endocrine Systems	Muscles and	Sensory Reception
Disorders	Excretion and	Muscle Systems	Supportive and
Circulation and	Excretory	Nerves and	Connective
Circulatory	Systems	Nervous Systems	Tissues
Systems	Immunity	Nutrition	Transplants, Organ
Diagnosis and	Infectious Diseases	Poisons and	and Tissue
Therapeutics		Poisoning	

MICROPAEDIA: Selected entries of reference information

General subjects

*diagnosis—laboratory**tests:*

amniocentesis
basal metabolic rate
blood analysis
blood count
Bromsulphalein test
cardiac catheterization
electrocardiography
electroencephalography
electromyography
endoscopy
enzyme analysis
glucose tolerance test
kidney function test
liver function test
Pap smear
patch test
Rubin's test
serological test
skin test
thyroid function test
tuberculin test
urinalysis

*diagnosis—**radiography and ultrasound:*

angiocardiology
angiography
brain scanning
cholecystography
contrast medium
diagnostic imaging
echocardiography
echoencephalography
myelography
phonocardiography
radiology
tomography
ultrasound
urography

diagnosis—other:

autopsy
diagnosis
gynecological examination
knee-jerk reflex
lumbar puncture
sphygmomanometer
stethoscope

disorders—allergic and immunological:

AIDS
allergy
anaphylaxis
angioedema

asthma
autoallergic disease
autoantibody
autoimmunity
drug allergy
hay fever
hypersensitivity
reagin
serum sickness

*disorders—blood**diseases:*

agranulocytosis
anemia
aplastic anemia
erythroblastosis fetalis
folic-acid-deficiency anemia
hemoglobinopathy
hemophilia
hereditary spherocytosis
iron-deficiency anemia
leukemia
leukocytosis
leukopenia
methemoglobinemia
pernicious anemia
polycythemia
purpura
septicemia
sickle-cell anemia
thalassemia
thrombocytopathy
uremia

disorders—cancers:

breast cancer
cancer
carcinogen
carcinoma
Ewing's tumour of bone
Hodgkin's disease
Kaposi's sarcoma
laryngeal cancer
leukemia
multiple myeloma
nephroblastoma
osteosarcoma
renal carcinoma
sarcoma
thyroid tumour
tumour

*disorders—**cardiovascular:*

air embolism
aneurysm
angioma
aorta, coarctation of the

aortic insufficiency
aortic stenosis
arteriosclerosis
arteriovenous fistula
arteritis
atrial fibrillation
bradycardia
cardiac arrhythmia
coronary heart disease
embolism
endocarditis
heart block
heart failure
heart

malformation
hypertension
hypotension
infarction
milk leg
mitral insufficiency
mitral stenosis
myocardial infarction
patent ductus arteriosus
pericarditis
pulmonary heart disease
pulmonary stenosis
purpura
Raynaud's disease
rheumatic fever
shock
stroke
syncope
tachycardia
thrombophlebitis
varicose vein
ventricular fibrillation
ventricular septal defect
Wegener's granulomatosis

disorders—cavity and membrane:

mediastinitis
peritonitis
pleurisy
pneumothorax
polyp
pyothorax
sinus squeeze
ulcer

*disorders—congenital and hereditary**metabolic diseases:*

acatalasia
alkaptonuria

Andersen's disease
cystic fibrosis
cystinosis
cystinuria
de Toni-Franconi syndrome
Fabry's disease
Forbes' disease
galactosemia
Gaucher's disease
glucose-6-phosphate dehydrogenase deficiency
glycogen storage disease
gout
Hartnup disease
Hers' disease
homocystinuria
Hunter's syndrome
Hurler's syndrome
iminoglycinuria
lipid storage disease
McArdle's disease
maple syrup urine disease
Maroteaux-Lamy syndrome
metachromatic leukodystrophy
methemoglobinemia
Niemann-Pick disease
phenylketonuria
Pompe's disease
porphyria
Sanfilippo's syndrome
Tay-Sachs disease
tyrosinemia
von Gierke's disease
Wilson's disease

*disorders—other**congenital and hereditary:*

achondroplasia
acrocephalosyndactyly
agenesis
albinism
Albright's syndrome
angioma
atresia and stenosis
cerebral palsy
chromosomal disorder
cleft palate

cleidocranial dysostosis	Dupuytren's contracture	kidney stone	hookworm disease
congenital disorder	herniated disk	nephroblastoma	ileitis
craniosynostosis	lupus	nephrosclerosis	indigestion
cretinism	erythematosus	nephrotic syndrome	intestinal diverticulum
cryptorchidism	tendinitis	pyelonephritis	intestinal obstruction
cutis laxa	<i>disorders—ear and hearing:</i>	renal carcinoma	intestinal squeeze
digit malformation	deafness	renal cyst	intussusception
Down syndrome	ear squeeze	renal osteodystrophy	megacolon
Dupuytren's contracture	earwax impaction	uremia	myiasis
dwarfism	labyrinthitis	urethritis	nausea
dysplasia	Ménière's disease	urinary tract obstruction	pancreatitis
erythroblastosis fetalis	otitis media	<i>disorders—eye and vision:</i>	peptic ulcer
Fallot, tetralogy of	presbycusis	amblyopia	proctitis
harelip	stirrup fixation	astigmatism	salmonellosis
heart malformation	<i>disorders—endocrine:</i>	blepharitis	trichinosis
hemophilia	acromegaly	blindness	trichomoniasis
hereditary spherocytosis	Addison's disease	cataract	vomiting
hermaphroditism	adrenogenital syndrome	colour blindness	<i>disorders—hepatic and biliary:</i>
intussusception	Albright's syndrome	conjunctivitis	cholecystitis
Klinefelter's syndrome	chromophobe adenoma	detached retina	cirrhosis
mandibulofacial dysostosis	cretinism	double vision	clonorchiasis
Marfan's syndrome	cryptorchidism	exophthalmos	fatty liver
microcephaly	Cushing's syndrome	glaucoma	gallstone
Morquio's syndrome	diabetes insipidus	hyperopia	hepatitis
muscular dystrophy	diabetes mellitus	keratitis	jaundice
neural tube defect	dwarfism	lens dislocation	leishmaniasis
neurofibromatosis	Fröhlich's syndrome	myopia	<i>disorders—infectious diseases caused by bacteria and related organisms:</i>
osteochondroma	gigantism	nystagmus	anthrax
osteogenesis imperfecta	granulomatous thyroiditis	ophthalmoplegia	bacteremia
patent ductus arteriosus	Graves' disease	optic atrophy	bartonellosis
pectus excavatum	Hashimoto's disease	optic neuritis	bejel
peromelia	hyperglycemia	presbyopia	boutonneuse fever
pseudohermaphroditism	hyperparathyroidism	ptosis	brucellosis
respiratory distress syndrome	hypoglycemia	retinitis pigmentosa	chancroid
Rett syndrome	hypothyroidism	retrolental fibroplasia	cholera
Siamese twin	myxedema	scleritis	diphtheria
sickle-cell anemia	parathyroid adenoma	strabismus	dysentery
teratology	adenoma	sty	glanders
thalassemia	pheochromocytoma	trachoma	gonorrhea
trisomy 13	Plummer's disease	uveitis	granuloma inguinale
trisomy 18	Riedel thyroiditis	visual-field defect	impetigo
Turner's syndrome	Sheehan's syndrome	<i>disorders—gastrointestinal:</i>	Legionnaires' disease
urogenital malformation	Stein-Leventhal syndrome	cestodiasis	leprosy
vittiligo	thyroid tumour	cholera	leptospirosis
von Willebrand's disease	thyroiditis	coccidiosis	listeriosis
<i>disorders—connective tissue:</i>	<i>disorders—excretory system:</i>	colic	Lyme disease
amyloidosis	Bright's disease	colitis	lymphogranuloma venereum
	cystitis	constipation	mastitis
	enuresis	diarrhea	melioidosis
	hematuria	dysentery	osteomyelitis
	kidney failure	enteritis	paresis
		fasciolopsiasis	plague
		gastritis	psittacosis
		gastroenteritis	

- puerperal fever
 pyelonephritis
 Q fever
 rat-bite fever
 rheumatic fever
 Rocky Mountain spotted fever
 salmonellosis
 scarlet fever
 scrub typhus
 septicemia
 streptobacillary fever
 sty
 syphilis
 tetanus
 toxic shock syndrome
 trachoma
 trench fever
 tuberculosis
 tularemia
 typhoid
 typhus
 whooping cough
 yaws
*disorders—**infectious** diseases caused by fungi:*
 actinomycosis
 aspergillosis
 blastomycosis
 candidiasis
 cryptococcosis
 histoplasmosis
 Madura foot
 mycosis
 nocardiosis
 ringworm
 sporotrichosis
 thrush
*disorders—**infectious** diseases caused by parasites:*
 ascariasis
 cestodiasis
 Chagas' disease
 clonorchiasis
 coccidiosis
 dysentery
 echinococcosis
 fasciolopsiasis
 filariasis
 hookworm
 kala-azar
 malaria
 onchocerciasis
 paragonimiasis
 schistosomiasis
 sleeping sickness
 toxoplasmosis
 trichinosis
 trichomoniasis
- disorders—**infectious** diseases caused by various agents:*
 conjunctivitis
 endocarditis
 infection
 meningitis
 otitis media
 pharyngitis
 pneumonia
 scrub typhus
 septic arthritis
 sexually transmitted disease
 splenitis
 tonsillitis
 zoonosis
*disorders—**infectious** diseases caused by viruses:*
 AIDS
 chicken pox
 Colorado tick fever
 common cold
 dengue
 encephalitis
 herpes simplex
 herpes zoster
 influenza
 kuru
 measles
 mononucleosis
 mumps
 pappataci fever
 poliomyelitis
 pox disease
 rabies
 Rift Valley fever
 roseola infantum
 rubella
 smallpox
 wart
 yellow fever
*disorders—**lymphatic** system:*
 Hodgkin's disease
 lymphedema
 lymphogranuloma venereum
 sporotrichosis
 tonsillitis
*disorders—**muscle**:*
 cramp
 dermatomyositis
 lumbago
 muscle tumour
 muscular dystrophy
 myasthenia gravis
 myositis
 myotonia
- tetanus
 tetany
 trichinosis
*disorders—**nervous** system:*
 Alzheimer's disease
 amyotrophic lateral sclerosis
 analgesia
 aphasia
 apraxia
 ataxia
 cerebral palsy
 chorea
 coma
 convulsion
 dementia
 dyslexia
 encephalitis
 epilepsy
 focal seizure
 grand mal
 herpes zoster
 hydrocephalus
 hyperactivity
 kernicterus
 kuru
 listeriosis
 meningitis
 microcephaly
 multiple sclerosis
 neural tube defect
 neuralgia
 neuritis
 paralysis
 paresis
 Parkinson's disease
 petit mal
 Pick's disease
 poliomyelitis
 psychomotor seizure
 rabies
 Rett syndrome
 sciatica
 senile dementia
 sleeping sickness
 spinal curvature
 syringomyelia
 tic
 Tourette's syndrome
 vertigo
*disorders—**nutritional** diseases:*
 anorexia
 anorexia nervosa
 beriberi
 bulimia
 calcium deficiency
 celiac disease
- chlorine deficiency
 cobalt deficiency
 copper deficiency
 fluorine deficiency
 iodine deficiency
 kwashiorkor
 magnesium deficiency
 malnutrition
 manganese deficiency
 obesity
 osteomalacia
 pellagra
 phosphorus deficiency
 rickets
 scurvy
 tropical sprue
 vitamin A deficiency
 vitamin A excess
 vitamin B₂ deficiency
 vitamin B₁₂ deficiency
 vitamin D excess
 vitamin E deficiency
 vitamin K deficiency
*disorders—**oral**:*
 canker sore
 caries
 gingivitis
 glossitis
 periodontitis
 thrush
 tooth squeeze
*disorders—**poisoning**:*
 antimony poisoning
 arsenic poisoning
 botulism
 cadmium poisoning
 fish poisoning
 food poisoning
 lead poisoning
 medicinal poisoning
 mercury poisoning
 mushroom poisoning
 poison
 shellfish poisoning
 venom
*disorders—**pregnancy** related:*
 abortion
 ectopic pregnancy
 hydatidiform mole

- miscarriage
 placenta accreta
 placenta praevia
 placentae abruptio
 placental
 infarction
 preeclampsia and
 eclampsia
 premature birth
 and postmature
 birth
*disorders—pressure
 injuries and other
 disorders caused by
 physical agents:*
 acceleration
 stress
 acoustic trauma
 air embolism
 altitude sickness
 barotrauma
 burn
 deceleration
 injury
 decompression
 sickness
 ear squeeze
 ebullism
 electrical shock
 frostbite
 heatstroke
 hypothermia
 intestinal squeeze
 motion sickness
 nitrogen narcosis
 radiation injury
 snakebite
 spatial
 disorientation
 sunburn
 thoracic squeeze
 wound
*disorders—
 reproductive:*
 amenorrhea
 cervical erosion
 cervicitis
 chlamydia
 cryptorchidism
 dysmenorrhea
 dyspareunia
 endometriosis
 galactorrhea
 gynecomastia
 hermaphroditism
 hydrocele
 impotence
 leukorrhea
 oligomenorrhea
 orchitis
 premenstrual
 syndrome
- priapism
 prostatic disorder
 pseudohermaph-
 roditism
 puerperal fever
 Stein-Leventhal
 syndrome
 uterine bleeding
 vaginitis
 vesiculitis
 vulvitis
*disorders—
 respiratory system:*
 alveolar
 proteinosis
 asbestosis
 atelectasis
 berylliosis
 black lung
 bronchiectasis
 bronchitis
 byssinosis
 common cold
 cough
 emphysema
 hyperventilation
 hypoxia
 influenza
 laryngeal cancer
 laryngitis
 Legionnaires'
 disease
 lung congestion
 lung infarction
 nasal polyp
 nasal tumour
 paragonimiasis
 pharyngitis
 pickwickian
 syndrome
 pneumoconiosis
 pneumonia
 psittacosis
 respiratory distress
 syndrome
 silicosis
 tracheitis
 tuberculosis
 whooping cough
*disorders—sexually
 transmitted
 diseases:*
 AIDS
 chancre
 chancroid
 chlamydia
 gonorrhea
 granuloma
 inguinale
 herpes simplex
 lymphogranuloma
 venereum
- proctitis
 syphilis
disorders—skeletal:
 achondroplasia
 acromegaly
 bone lesion
 callus
 cervical
 spondylosis
 cleidocranial
 dysostosis
 craniosynostosis
 dislocation
 dwarfism
 dysplasia
 Ewing's tumour of
 bone
 flatfoot
 fluorosis
 fracture
 gigantism
 hamartoma
 listeriosis
 mastoiditis
 metatarsalgia
 Morquio's
 syndrome
 multiple myeloma
 neurogenic
 arthropathy
 osteoarthritis
 osteochondroma
 osteogenesis
 imperfecta
 osteomyelitis
 osteoporosis
 osteosarcoma
 Paget's disease of
 bone
 parathyroid
 adenoma
 rheumatoid
 arthritis
 septic arthritis
 spondylolisthesis
 spondylosis
disorders—skin:
 acne
 baldness
 bedsore
 blister
 boil
 carbuncle
 corn
 cutis laxa
 erythema
 exfoliative
 dermatitis
 hemangioma
 herpes simplex
 herpes zoster
 hives
- hyperhidrosis
 ichthyosis
 impetigo
 itching
 keratosis
 leishmaniasis
 mole
 nevus
 pemphigus
 pinta
 pseudoxanthoma
 elasticum
 psoriasis
 ringworm
 scabies
 scleroderma
 ulcer
 vitiligo
 wart
disorders—other:
 asthenia
 atrophy
 childhood diseases
 and disorders
 cyst
 dehydration
 disease
 diverticulum
 edema
 empyema
 fetal alcohol
 syndrome
 fever
 gangrene
 hamartoma
 headache
 hernia
 hiccup
 hypophospha-
 temia
 Kawasaki
 syndrome
 lesion
 potassium
 deficiency
 progeria
 prolapse
 Reye's syndrome
 sarcoidosis
 Sjögren's
 syndrome
 sodium deficiency
 splenitis
 splenomegaly
 sudden infant
 death syndrome
 tumour
infectious agents:
 adenovirus
 bacterium
 prion
 virus

<i>treatments—</i>	cryosurgery	antidepressant	occupational
<i>prosthetic devices:</i>	gastrectomy	artificial	therapy
artificial heart	heart transplant	respiration	physical therapy
contact lens	hysterectomy	blood transfusion	pseudolaryngeal
denture	kidney transplant	chemotherapy	speech
eyeglasses	microsurgery	desensitization	radiation therapy
hearing aid	radial keratotomy	dialysis	respiratory therapy
pacemaker	skin graft	diathermy	therapeutics
prosthesis	surgery	hydropathy	
<i>treatments—surgery:</i>	transplant	hydrotherapy	
abortion	vasectomy	hyperbaric	
amputation	<i>treatments—</i>	chamber	
cesarean section	<i>therapeutics:</i>	massage	
coronary bypass	acupuncture	moxa treatment	

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See Section 10/35 of Part Ten

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Section 424. The Practice of Medicine and the Care of Health

- A. Medical education
- B. Fields of specialized medical research; the related disciplines of osteopathy, dentistry, and nursing
[see 10/35.C.]
- C. The practice of medicine
 1. The kinds of medical practice in various countries
 - a. General practice and first-contact care: the general practitioner versus the specialist, clinic and health centre practice
 - b. Hospital and specialist practice: general surgery, pediatrics, anesthetics, pathology, teaching practice
 - c. Governmental practice: public health service, military practice, space medicine
 - d. Research
 2. Maintenance of professional standards
 - a. The ethical basis of medical practice; *e.g.*, the Hippocratic oath, problems relating to euthanasia and abortion
 - b. Licensure requirements for practice: the wide variation among countries
 - c. Legal restrictions on practice
 - d. Professional organizations and the maintenance of standards
- D. Public health services and administration
- E. Hospital services and facilities
- F. Environmental sanitation and health: the control of air, water, and soil pollution
[see 737.C.1.]
- G. Efforts directed toward the prevention of malnutrition: the recognition and attempted solution of problems relating to nutrient requirements, world food supply, and world population
- H. The prevention and control of infection
 1. Vaccination and immunization
 2. The quarantine and isolation of infected victims
 3. Destruction of infectious agent or carrier; *e.g.*, aseptic and antiseptic precautions, control of disease carriers, disinfection
 4. The use of therapeutic agents and prophylactic medication
 5. The prevention and control of epidemics

I. Industrial and social medicine

1. The scope of industrial and occupational medicine
2. Health and safety laws: the regulation of working hours; restrictions on female and child labour; the elimination of health, safety, and fire hazards; the control of foods and drugs; pollution control
[see 552.D.]

J. The economics of health and disease

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the practice of medicine and the care of health

Birth Control
Medicine
Occupational Diseases and Disorders

MICROPAEDIA: Selected entries of reference information

General subjects

<i>agencies and programs:</i>	chiropractic	<i>medical ethics:</i>	blood bank
Food and Drug Administration	dental auxiliary	abortion	contraception
International Fund for Agricultural Development	dentistry	euthanasia	flying doctor service
Medicare	epidemiology	Hippocratic oath	health maintenance organization
National Health Service	hematology	medical jurisprudence	hospice
National Institutes of Health	industrial medicine	<i>preventive medicine:</i>	hospital
World Health Organization	midwifery	immunization	medical association
<i>health-care fields:</i>	nursing	preventive medicine	planned parenthood
aerospace medicine	optometry	quarantine	public health
	osteopathy	<i>other:</i>	social security
	paramedical personnel	American Medical Association	
	pharmacy	birth control	
	plastic surgery		
	psychiatry		
	surgery		

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Division III. Human Behaviour and Experience

[For Part Four headnote see page 143.]

The outlines in the six sections of Division III set forth the discoveries and theories in the psychological sciences concerning human capacities, human behaviour, and human experience.

Section 431 is concerned with the questions of the definition and origins of human behaviour and experience. It also indicates the stages in the development of a person's behaviour and experience.

The outline in Section 432 deals with the capacities by which humans receive, organize, and interpret information about the current environment that influences behaviour. It treats the following subjects: attention; sensation; perception; the perception of time, of space, and of movement; perceptual illusions and hallucinations; and parapsychological phenomena.

Section 433 is concerned with current internal states that affect behaviour and conscious experience. It treats the determinants and manifestations of activation level; motivational states; emotional states; and transient states affecting behaviour and experience, such as sleep, dreams, hypnosis, fatigue, and intoxication.

Section 434 is concerned with persisting capacities that influence human behaviour and conscious experience. The outline treats the nature and assessment of human abilities and attitudes; sensorimotor abilities; intellectual abilities; and the distribution of intelligence.

Section 435 is concerned with the development of a person's potentials by learning and thinking. The outline treats diverse general theories of learning; deals separately with psychomotor, perceptual, and conceptual learning; and then treats memory and forgetting and the theories about and the types of the higher thought processes.

The outline in Section 436 sets forth those parts of psychology, psychopathology, and psychotherapy that consider the functioning, the integration, and the disintegration of the person as a whole. It treats diverse definitions and theories of personality and the self; theories of personality adjustment and maladjustment; and the kinds of mental disorders and their psychiatric treatment.

Section 431. Human Nature and Experience: General Considerations 160

- 432. Influence of the Current Environment on a Person's Behaviour and Conscious Experience: Attention, Sensation, and Perception 161
- 433. Current Internal States Affecting a Person's Behaviour and Conscious Experience 163
- 434. Persisting Capacities and Inclinations That Influence Human Behaviour and Conscious Experience 164
- 435. Development of a Person's Potentials: Learning and Thinking 165
- 436. Personality and the Self: Integration and Disintegration of the Person as a Whole 166

Section 431. Human Nature and Experience: General Considerations

- A. The relative contribution of opposing factors in human behaviour and conscious experience, the degree to which these factors interact to produce human behaviour and conscious experience
 - 1. Mankind as radically distinct from nature and mankind as homogeneous and continuous with the rest of nature
 - a. Behavioral capacities and performances that humans have in common with other primates and higher mammals
 - b. Behavioral capacities and performances held to be distinctive of humans; *e.g.*, propositional language, cumulative transmission of culture
 - c. The explanation of allegedly distinctive human traits in accordance with the principle of phylogenetic continuity: the evolutionary development of mankind
[see also 341 and 411]
 - 2. The relative weights of genetic and environmental factors: the nature–nurture controversy
 - a. Elements of genetic endowment; *e.g.*, physiological and psychological characteristics, reflexes and instincts
 - b. Environmental conditions; *e.g.*, ecological factors, cultural conditioning, personal socialization experiences
 - 3. Cognitive, conative, and affective dimensions of behaviour and experience
 - a. The cognitive dimension: sensation and perception; memory and imagination; concept formation, ideation, and reasoning
 - b. The conative dimension: desires, needs, cravings, drives; motivation and purpose; the voluntary and the involuntary
 - c. The affective dimension: the emotions, the pleasant and the unpleasant; the sentiments
 - 4. The observed elements of behaviour and the inferred dispositional tendencies: actions and powers; habits, inclinations, and capacities
 - 5. Emergent problems in the study of human behaviour and experience: the data and hypotheses of parapsychology; the comparison of human and artificial, machine-created intelligence
- B. Stages in the development of human behaviour
 - 1. General aspects of human development
 - 2. Prenatal growth and development
 - 3. Birth: effects of the birth experience on the person's subsequent history
 - 4. Infancy: the first 18 months
 - 5. Early childhood and childhood: one to 12 years
 - 6. Adolescence: puberty to adulthood
 - 7. Young adulthood and maturity
 - 8. Old age and death
[see also 338.E.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major article dealing with human nature and experience: general considerations

Behaviour, The Development of Human

MICROPAEDIA: Selected entries of reference information

General subjects

adolescence	emotion	instinct	puberty
adulthood	etiquette	intelligence	reflex
attitude	habit	memory	sibling rivalry
behaviour genetics	human behaviour	middle age	thanatology
child development	imitation	old age	thought
culture	infancy	psychological	
creativity	insight	development	

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See Sections 10/35 and 10/36 of Part Ten

INDEX: See entries under all of the terms above

Section 432. Influence of the Current Environment on a Person's Behaviour and Conscious Experience: Attention, Sensation, and Perception

A. Attention to the environment: awareness of internal and external events

[see 341]

1. The problem of defining attention
2. Development of theories of attention: influence of stimulus-response and behaviourist studies
3. Classification of attentive phenomena: influence of adaptive processes on modes and degrees of attention
4. Determinants of attention: temperament, health, social suggestion, novelty, interests, and unconscious influences
5. Physiological mechanisms of attention
6. Analysis of attentive phenomena in terms of information theory

B. Sensation: the reception of information about the environment

1. The senses in general

[see 421.J. and 423.F.9.]

2. Vision

- a. The work of the retina
- b. The transduction process: the conversion of the retinal image into a set of messages in the brain
- c. Perceptual processes of vision
- d. Responses of the cerebral cortex to visual stimuli

3. Audition

- a. The mechanisms of the external, middle, and inner ear: functions and processes involved in the transmission of sound and its conversion into neural messages
- b. The work of the auditory nerve and the auditory pathways of the central nervous system: encoding, processing, and discrimination of pitch, loudness, localization, and duration of sound
- c. The measurement of auditory phenomena: diagnosis and correction of hearing disorders
- d. The function of the semicircular canals in maintaining equilibrium: the vestibular systems
[see B.6., below]

4. Cutaneous senses: the punctate nature and discriminatory capacity of skin to respond to pressure, pain, heat, and cold

- a. The variety of nerve terminals exhibiting a broad range of sensitivity to different stimuli

- b. Localization of skin sensations: the nature of dermatomes
 - c. The concept of adequate stimulation and paradoxical cold: adaptation to pressure and thermal situations; itch, tickle, and vibration
 - d. The sensory experience of pain: its cause and function; external signs and qualities, theories of pain, modes of treatment
- 5. Kinesthesia: the function and types of sensory structures and the role of kinesthetic feedback in movement control and orientation
- 6. Vestibular senses: the role of the vestibular receptors and the semicircular canals of the inner ear in maintaining equilibrium
- 7. The taste sense: the form and location of taste buds, the neural pathways, types of taste receptors, factors affecting taste
- 8. The olfactory sense: the form, location, and nerve supply of olfactory receptors; olfactory qualities; odour-inducing factors; factors affecting odour sensitivity; effects on behaviour
- C. Perception: the process of translating sensory stimulation into organized experience
 - 1. Contemporary theories and new concerns: the influence of Gestalt and behaviourist theories
 - 2. Central problems of continuing concern
 - 3. Principles of perceptual organization
 - a. The Gestalt principle of *Prägnanz*, or good form, and the laws of grouping under it: closure, good continuation, similarity, proximity, and common fate; the significance of the phi phenomenon
 - b. Context effects: the influence of surrounding stimuli and of previously experienced stimuli on the observer
 - c. Perceptual constancy: the tendency of objects to appear stable in size, shape, brightness, or colour despite changing conditions of stimulation
 - 4. Differences in perceptual functioning among individuals, among classes of individuals, and within individuals
- D. The perception of time
 - 1. Sequential activities related to time perception
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 - 2. Perception of depth and distance: gross tactual-kinesthetic, eye muscle, visual, and auditory cues
 - 3. Interrelations among the senses
 - 4. Social and interpersonal aspects of space perception: territorial behaviour, reason in perception, and nativistic and empiricistic considerations
- F. The perception of movement
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 - 2. Nonvisual cues: auditory, kinesthetic, and vestibular cues
- G. Perceptual illusions and hallucinations
 - 1. Types of illusory experience
 - 2. Hallucinations
 - a. Neurological factors in hallucinations
 - b. Types of hallucinatory experience
- H. Theories of parapsychological phenomena
 - 1. Extrasensory perception: telepathy, clairvoyance, precognition, and prophecy
 - 2. Parapsychological phenomena of a nonperceptual nature: psychokinesis

3. Theories of perceptual and of nonperceptual parapsychological phenomena: physical theories, field theories, and theories of the collective unconscious; projection hypothesis

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the influence of the current environment on a person's behaviour and conscious experience: attention, sensation, and perception

Attention

Perception, Human

MICROPAEDIA: Selected entries of reference information

General subjects

<i>parapsychological</i>	consciousness	synesthesia	sensation
<i>phenomena:</i>	delirium	time perception	sense
extrasensory	eidetic image	<i>sensation:</i>	smell
perception	hallucination	chemoreception	sound reception
parapsychological	illusion	flavour	thermoreception
phenomenon	movement	mechanoreception	<i>other:</i>
precognition	perception	pain	attention
telepathy	pain	photoreception	circadian rhythm
<i>perception:</i>	perception	proprioception	stress
autokinetic effect	space perception	receptor	human behaviour

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 3. Expression of emotions: the startle response; facial, vocal, and postural manifestations
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 2. Dreams
 3. Hypnosis and related states of altered consciousness
 4. Fatigue
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Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the current internal states affecting a person's behaviour and conscious experience

Emotion, Human
Motivation, Human

Sex and Sexuality
Sleep and Dreams

MICROPAEDIA: Selected entries of reference information

General subjects

<i>emotional states:</i>	<i>sexual behaviours</i>	transvestism	insomnia
anxiety	<i>and problems:</i>	voyeurism	narcolepsy
emotion	bisexuality	<i>transient states—</i>	sleep
empathy	dyspareunia	<i>chemically induced:</i>	snoring
feeling	exhibitionism	alcoholism	<i>transient states—</i>
temperament	frigidity	antidepressant	<i>other:</i>
<i>motivational states:</i>	homosexuality	drug abuse	combat fatigue
agonism	impotence	hallucinogen	fatigue
conflict	masochism	narcotic	hypnosis
drive	masturbation	sedative-hypnotic	<i>other:</i>
libido	pedophilia	drug	consciousness
motivation	rape	stimulant	introspection
scatologia	sadism	tranquilizer	unconscious
sex	sexual dysfunction	<i>transient states—</i>	
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B. The assessment of human abilities: psychological measurement

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2. Development of standardized tests
3. Assessment of test results

C. Sensorimotor abilities: bodily skills and mechanical abilities

D. Intellectual abilities: theories of intelligence

E. The distribution of intelligence

1. Problems concerning the establishment of intelligence standards and intelligence distribution
2. Retardation
3. The gifted
4. Group differences in intelligence: the measurement and interpretation of differences in age, socioeconomic class, race, sex, and other factors

F. Personal propensities and idiosyncrasies affecting behaviour and experience

G. Attitudes

1. The nature of attitudes

2. The functions of attitudes
3. The development of attitudes
4. The measurement of attitudes: the use and validity of questionnaires, interviews, sampling techniques, opinionnaires, and content analysis

H. Persuasion and change of attitude

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the persisting capacities and inclinations that influence human behaviour and conscious experience

Intelligence, Human
Psychological Tests and Measurement

MICROPAEDIA: Selected entries of reference information

General subjects

aptitude test	genius	intelligence test	psychological
creativity	gifted child	mental age	testing
differential	human behaviour	mental retardation	sensorimotor skill
psychology	intelligence	prodigy	

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 3. Transfer of training
- B. Psychomotor learning
- C. Perceptual learning
- D. Conceptual learning and concept formation
- E. Memory: retention and forgetting of learned habits and content
- F. Abnormalities of memory: amnesia, paramnesia and confabulation, hypermnnesia—enhancement of memory
- G. The higher thought processes
 1. The psychology of higher thought processes
 2. The role of language in the higher thought processes
 3. Meaning
 4. Types of thinking: realistic and autistic

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the development of a person's potentials: learning and thinking

Learning and Cognition, Human
Memory
Thought and Thought Processes

MICROPAEDIA: Selected entries of reference information

General subjects

amnesia	conditioning	memory	recognition
association	discrimination	mnemonic	suggestion
attitude	generalization	perceptual learning	thought
brainwashing	imitation	psychomotor	training, transfer of
cognition	insight	learning	
concept formation	learning		

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4. Eclectic theories of personality: role theories, factor analysis of personality traits

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2. Evaluating assessment techniques

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2. Strains and challenges put on adequate personality functioning: physical, psychological, and social stresses; *e.g.*, frustration, conflict, personal inadequacy, deprivation of accustomed gratification
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1. Major categories of mental disorders: organic mental disorders, schizophrenia, paranoid disorders, affective disorders, anxiety disorders, obsessive-compulsive disorders, posttraumatic stress disorders, somatoform disorders, dissociative disorders, personality disorders, psychosexual disorders, disorders of infancy or childhood
2. Prevalence of mental disorders: epidemiology
3. Causation of mental disorders
4. Psychiatry, the treatment of mental disorders: pharmacotherapies, psychotherapies, other therapies

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and a biography dealing with personality and the self: integration and disintegration of the person as a whole

Freud
Mental Disorders and
Their Treatment
Personality

MICROPAEDIA: Selected entries of reference information

General subjects

<i>personality—tests:</i>	<i>psychiatric</i>	paranoia	psychodrama
association test	<i>disturbances:</i>	personality disorder	psychopharma-
projective test	affective disorder	phobia	cology
Rorschach Test	anxiety	psychoneurosis	psychosurgery
<i>personality—theories:</i>	autism	psychosis	psychotherapy
anal stage	delusion	psychosomatic	sensitivity training
analytic psychology	depression	disorder	shock therapy
defense mechanism	fetishism	pyromania	<i>other:</i>
ego	hypochondriasis	schizophrenia	Bedlam
humour	hysteria	<i>therapies:</i>	counseling
id	kleptomania	aversion therapy	human behaviour
inferiority complex	lycanthropy	behaviour therapy	mental hygiene
introvert and	manic-depressive	biofeedback	sibling rivalry
extrovert	psychosis	child psychiatry	stress
Oedipus complex	mental disorder	group therapy	
oral stage	multiple	lobotomy	
personality	personality	nondirective	
self	obsessive-compulsive	psychotherapy	
superego	disorder	psychoanalysis	

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Introduction to Part Five:

Man the Social Animal

by *Harold D. Lasswell*

We are part of society when we share in comprehensive arrangements for living with one another and for managing the environment. The simplest societies are the primitive bands who to this day live in jungles and deserts, and on isolated mountains and beaches around the globe. The most complex technological societies bind the world's cities together as part of an evolution that, barring catastrophe, is forming a planetary society of mankind.

Whether primitive or civilized, all societies must cope with the parallel problems that are generated by the urgencies of human nature and the necessities of a common life. Arrangements are made for kinship and procreation; for safety, health, and comfort; for producing and consuming commodities and services. Arrangements also develop latent talent into skills of communication, body movement, and environmental management. Institutions specialize in the gathering and dissemination of news and images of the natural and social environment. Some institutions give respect or disrespect to individuals and groups on a temporary or permanent basis, and distinguish between what is considered to be responsible or irresponsible conduct. Government, law, and politics seek to resolve the conflicting demands that arise within or among communities.

At first glance we are less likely to be impressed by the parallels than by the differences among societies. The differences are conspicuous, if we consider, say, a horde of big-city commuters as compared with a band of technologically handicapped people who are continually in search of the next meal. An anthropologist who lived with such a band a few years ago in the rain forests of eastern Bolivia reported that apart from the hammocks they slept in, three-foot digging sticks, and cumbersome long bows and arrows, these naked seminomads carried no material objects with them. Modern urban dwellers usually feel some contempt for these bearers of an Old Stone Age culture and speculate on a possible weakness of the brain to account for their lack of technological progress. Such speculations are dismissed by modern anthropologists as without foundation. As we get acquainted with primitive societies it dawns upon us that they have met some of the same problems that we have by adopting solutions whose ingenuity equals or even excels our own. This may apply, for instance, to arrangements for transmitting political authority from one generation to the next, or for preventing violently aggressive behaviour.

Societies do indeed differ from one another in the degree that they encourage specialization. In the simplest societies everybody does everything, with exceptions that are closely linked to differences of sex and age. On the other hand, many tribes use professional specialists, such as warriors, medicine men, blacksmiths, potters, weavers, musicians, and carvers. The world that we call civilized appeared with the invention of writing. Literacy provides a means of stor-

ing and retrieving information without relying exclusively on the memory of the old. Records and education multiply the number of learned professions. Urban civilization marks the emergence of such institutions as the territorial state, formal legislative codes of law, regular taxes, bureaucratized civil and military services, monumental public works, complex systems of taxation, and official records.

One way to bring out the degrees of likeness and difference among societies, whether primitive or civilized, is to compare the priorities that are given to institutions of the same kind. No one doubts that every society must concern itself to some extent with food. It is only in bands of the kind mentioned above that near-total preoccupation with hunger deemphasizes, although without abolishing, all other interests. Where existence is less hard the accumulation of wealth may become the principal value sought, as among some merchant cities and trading tribes. War and preparation for war may take top priority as it did for millennia among the shepherds of Inner Asia and the river-valley agriculturalists who were conquered by herdsman-warriors. Some agricultural societies emphasize worship and encourage forms of knowledge, like astronomy, that enhance religion. In some societies, notably in East India, the accent is on ritual purity or impurity, and every kin group is assigned a position in the respect system of caste and class.

While priorities may remain stable for generations in a given society, this is not necessarily the case. At one time the peoples of Scandinavia were warriors and brigands. Today we perceive them as among those who are most involved with the values of civil society. In the United States, the early colonizers of New England were heavily oriented toward religion, morality, and political freedom. More recently, the most general trend has been toward secular activities, especially those connected with wealth. Throughout the contemporary world, "development" often carries the connotations of economic modernization, political independence, scientific education and research, personal freedom, and social justice.

Besides allocating priorities, every society strikes a temporary or durable balance between the accumulation and the immediate enjoyment of every value. The modes of accumulation depend on the value in question. Investment in wealth production, for instance, may involve adding fertilizers to the soil, or building an infrastructure of roads and bridges, or inculcating the values of saving and investment. Expanded educational opportunity implies that more per capita hours of teaching and learning, and more physical equipment, are made available, and that the importance of education is successfully communicated. If health opportunities are to be multiplied, it is necessary to add facilities and to spread the practice of personal hygiene. A society cultivates public enlightenment with installations for scien-

tific and scholarly purposes, and for mass communication. Human relations improve as the roles of love, friendship, and loyalty expand in "an era of good feeling," and as social discrimination wanes. Levels of responsible conduct typically rise as opportunities become more available for worship and more people join in formulating and applying moral standards. During a given period the institutions of government, law, and politics sometimes accumulate more support.

The examples mentioned above refer to the "positive" accumulation of a valued outcome. Accumulations may be "negative," as when disasters destroy property, spread epidemics, or interfere with education.

All societies necessarily make arrangements for the sharing of wealth, power, and other values. Among individuals and groups these arrangements exhibit all degrees of equality and inequality. Wealth and income are sometimes widely distributed. By contrast, they may be monopolized in the hands of a few. Political participation may be dispersed or concentrated. Opportunities may be equalized or monopolized for health, education, and information; or for respect, affection, and responsible conduct.

Characteristic of every society is the attempt to maintain itself by controlling the minds of young and old. People not only hunt or plow, trade or fight. They are also likely to believe in what they do and how they do it. It is not necessarily true that in a system of inequality those who occupy any particular station, however exalted or lowly, entertain any doubts about the justification of the system. A stable society carries on within the framework of a common map of perception, belief, and identity. In such a setting the individual learns from earliest infancy to think, feel, and act in ways that bring positive rather than negative consequences from the social and natural environment. Socialization is the process by which private motivations are channeled into acceptable public acts.

In civilized societies reliance on the results of early education is heavily supplemented by government, law, and politics. The legal system is made up of several sets of authoritative and controlling prescriptions. One set is constitutive. It prescribes "who decides what and how." It centralizes or decentralizes formal and effective power, and it separates power among agencies and groups. Structures may be differentiated to plan, to promote, to legislate, to execute, or to review and appraise. Regulation defines the degree of protection given to the fundamental institutions of every sector of society. Tradition alleges that a legal order is blind to values and practices that lie outside the established beliefs, faiths, and loyalties ("ideologies") of the society with which it is involved. In consequence, legal systems may defend widely different balances between value accumulation and enjoyment, and sharply contrasting patterns of equality and inequality in the sharing of political power, wealth, respect, or any other value. The legal order may protect economic systems whose structures are capitalistic, socialistic, or cooperative; family systems that permit one or more members of the sexes to marry and raise children; religious faiths that exalt monotheism and polytheism; and so on through the infinite variety of human practices.

One set of prescriptive norms is supervisory. Individuals and groups may be given wide latitude to make private

contractual agreements or to seek redress of private wrongs. Nonetheless, the decision makers of the community are prepared to play a supervisory role by enforcing common norms if an unsettled private controversy is brought to their notice by the parties. Prescriptions also lay down the principles and procedures to be followed if the body politic organizes and administers a continuing enterprise, of which services of transportation, communication, banking, insurance, and housing are examples. A legal system includes correctional or sanctioning measures to obtain compliance with prescribed norms. Value deprivations are imposed on those who have failed or are expected to fail to comply. Deprivations range in severity from capital punishment, confiscation of property, or life imprisonment, to a light fine or reprimand.

A legal system is stabilized when the effective elements in society perceive themselves as relatively better off by continuing the system than by adopting alternative arrangements. To some extent a legal order may exhibit cyclical fluctuations, as when deviations are tolerated within limits which, if exceeded, generate reform activities that restore the former situation with little change. In a capitalist economy "creeping monopoly" may invade trade unions, employers' associations, or natural resource and industrial enterprises. In a socialist economy "black markets" may introduce "creeping competition." In either case, cyclical movements may restore the original relationship before they have quietly stabilized a structural innovation, or prepared the way for violent revolutionary change.

If the view is correct that worldwide interdependence is increasing, the traditional blindfold of legal systems must be put aside long enough to give explicit consideration to competing value goals and practices around the globe. Interdependence implies that whether they like it or not, the members of an emerging planetary society must take one another into account. Being taken into account implies that beliefs, faiths, and loyalties, as well as overt behaviours, are examined by public and private decision makers. The demand to be better informed about the social environment creates an enormous opportunity and responsibility for those who study society.

We expect anthropologists to provide us with knowledge of primitive societies and other specialists to focus on the processes and institutions of civilized society. Political scientists and legal scholars concentrate on government, law, and politics. Economists specialize in the production and distribution of wealth. The role of educators is relatively clear. So, too, is the role of sociologists who concern themselves with a sector of society, such as the family, social class and caste, professions and occupations, communication, public health, or comparative morals and religion.

Social scientists are continually under pressure to provide a map of the past and probable future impact of the forces that shape society. They are asked, for instance, to explain the causes of war and other forms of violence, and to suggest strategies that lead to "victory" in a specific conflict or to show how war itself may be eliminated as an instrument of public policy. Social scientists are asked for explanations of why an economy experiences inflation, or how it generates changing levels of employment and unemployment. Specialists are expected to discover the sources of alienation that separate young and old or threaten the

unity of a family, a school, a church, a political party, or a national state. These examples suggest the wide-ranging demands that confirm the importance of adding to our knowledge of society.

We recognize the existence of a problem when we perceive that our goals are inconsistent with one another or when there are discrepancies between what we want and what we have or expect. In public policymaking, the first step is to answer the question, "Whose values are to be realized?" The social scientist who participates in tackling or solving a policy problem has an option: he may adopt the criteria of a "client" or he may rely on his own values.

The study of social institutions is sometimes affected by diverging norms of professional responsibility. No conflict need arise if a social scientist is personally committed to a line of research that happens to be popular with influential members of the body politic. No anxiety or guilt is felt if the findings are applied by current decision makers. A frequent example is the study of administrative agencies according to their "dollar efficiency" or according to the accuracy and speed of communication between central offices and field stations.

In contrast to this harmonious relationship is the inner and perhaps visible turmoil of social scientists whose research interests are unacceptable to many members of the current establishment. The researchers may want to study the effect of military expenditures on society. The problem may be to find how a given level of military outlay modifies the structure of the civilian economy and influences both the production and delivery of services specialized for health, education, public information, family welfare, and other social outcomes. If the information gathered in the course of a given project is classified as secret, no scientist can lawfully report his findings. Perhaps the investigator will violate the letter of the law in the hope of mobilizing an effective demand for change. But it may be that such a strategy will backfire. Instead of arousing community protest against authority, the revelations may result in established leaders successfully taking advantage of an alleged "breach of security" to suppress inquiry and discussion.

Another complication affecting the social investigator is the degree of genuine consent that he must obtain from those whom he proposes to study. Physicians, surgeons, and biologists confront similar questions when they plan to give a test, run an experiment, administer a drug, or perform an operation. Is it always necessary to explain to a prospective subject the risks he will run? Is the investigator professionally or legally bound to make sure that the language of explanation can be understood by the individual concerned? If a social scientist plans to study the facts of life in a prison or a mental hospital, should he reveal his purpose, even when it would be easier to gain confidence by posing as a fellow prisoner or a fellow patient? Similar issues rise in connection with field studies of primitive tribes, of peasant communities, of foreign societies, and of many other social settings.

In recent times, professional opinion has emphasized the importance of obtaining "shared participation" in the pursuit of knowledge. Many investigators willingly accept the challenge of cultivating group demand for a project and for a hand in data gathering and analysis. At every stage, arrangements are made for laymen to work side by

side with professional sociologists, social psychologists, political scientists, and other investigators. As a result, some communities have learned to study themselves, assessing the degree to which they are involved in ethnic and other forms of discrimination. Unusual groups have joined in self-study. For instance, murderers and persons who have survived as targets of murderous assault have cooperated in scientific research on the causes and consequences of murder, and on possible strategies of prevention. Instead of resenting the role of "guinea pig" in science, it is typical for those who choose to participate in programs of self-observation to improve their individual insight while contributing to the enhancement of society's stock of knowledge.

Whether the client or the investigator is the source of the value criteria adopted for a policy problem, questions of value priority are bound to arise. The relative importance of political, economic, and other aims cannot be satisfactorily settled in programs of national or regional development unless the full range of possible goals is considered. It is essential to take timing into account. When a new nation-state first secedes from an empire, political power has top priority. The "ex-colony" tries to ensure its independence of external control, to obtain support from outside powers, and to unify its people. Economic development occupies a high priority position. Other targets, such as health, education, the expressive arts, and environmental protection, seem to be less urgent. The allocation of manpower and facilities to various institutions depends on the priority of the specific outcomes in which these institutions specialize.

Social scientists have an indirect influence on priorities by asking questions about them, and also by presenting a factual map of past trends, causes, and future contingencies. Scientists often devise small-scale pretests in order to try out solutions that may eventually be applied on a larger scale.

In adapting to the needs of this interdependent world, the scientists of society require of themselves that they measure the direction and intensity of the value demands of political, economic, ethnic, and all other identifiable groups anywhere on the globe. Acknowledging the perils of a divided and militant world, the most compelling task is to discern and make public the conditions under which a world public order of government and law could become a more perfect instrument of human dignity, security, and welfare. Many small-scale programs show how to reduce the human cost of transforming today's inadequate institutions into more effective systems of communication and organization.

For the first time in history it can be truly asserted that the scientists of society have been provided with technological instruments of sufficient sophistication to assist in meeting the demands that are made upon them. Retrieval and dissemination make it possible to map past, present, and future events. Social analysts know that the key question for the future is to resolve whether or not the spectacularly changing technology of knowledge, and especially knowledge of society, will be in the hands of a limited class or caste that seeks to serve its own advantage. The alternative is to share the control of information widely among all territorial and pluralistic groups. Unless individuals and groups are able to obtain access to com-

prehensive stocks of information, they will be blind judges of public policy. Without adequate access, their criticism will be dismissed as exercises in ignorance and bias. Critics will be in no position to develop realistic alternatives to the plans of governmental or private monopolists of knowledge. "Knowledge is power"; if there is to be self-control, there must be prompt and total access to information.

The chief novelty about the computer and other technically advanced means of processing and transmitting information is that, in principle, everyone can be given prompt access to a selective "map of the whole." An image of the total deployment of man in space or of the total activities

of a corporate enterprise can be made available to everyone from the highest official to the humblest worker. The salient facts can be made vivid, concise, and substantially accurate in images that may be supplemented in whatever detail is desired. The range of possible expenditures for any political, economic, or social program can be summarized and related to its potential impact on society.

Human society has attained an unparalleled height of danger and opportunity. The study of society shares in both. The unprecedented accumulation of knowledge enables us to recognize that the scale of our problems is also without precedent.

Part Five. Human Society

All studies of mankind take account of the effect of the social nature of humans. This is true of the treatment in Part Four of human evolution, health, and general nature and behaviour. It is also true of the treatments, in subsequent parts, of art, technology, religion, history, and the sciences and philosophy.

A special set of interrelated sciences, however, takes society and social behaviour as its direct subject of inquiry. The outlines in the six divisions and the twenty-five sections of Part Five are concerned with the complementary work of these social sciences.

The social sciences have themselves been the object of historical and analytical study. These studies are presented in the articles referred to in Section 10/36 of Part Ten. The outline in that section covers the history of the social sciences generally, and the nature, scope, methods, and interrelations of anthropology, sociology, economics, and political science.

The social sciences have become increasingly interdependent and interpenetrating, and no regulative agreement exists about how their distinction should be understood. Nevertheless, the diverse domains are, in practice, distinguishable. The breakdown of Part Five into six divisions reflects the currently operative distinction between cultural and social anthropology, the several branches of sociology, economics, political science, jurisprudence and law, and educational philosophy and science.

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Division I. Social Groups: Peoples and Cultures

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2. On the Northwest Coast

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4. On the Plateau

5. In the Great Basin

6. In the Southwest

7. On the Plains

8. In the eastern woodlands

9. In the Southeast

- C. In Middle America
 - 1. In northern Mexico
 - 2. In Mesoamerica
 - 3. In Central America and the northern Andes
 - 4. In the Caribbean
- D. In South America
 - 1. In the central and southern Andes
 - 2. In the tropical forest
 - 3. Among the South American nomads
- E. In Europe
 - 1. On the Atlantic fringe
 - 2. On the plain
 - 3. Along the Mediterranean
 - 4. On the Alpine climax
- F. In the Middle East and North Africa
 - 1. In the Maghrib: northwestern Africa
 - 2. In the Mashriq: northeastern Africa and southwest Asia
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 - 4. In Turkey
- G. In Asia
 - 1. In Siberia
 - 2. In Central Asia
 - 3. In East Asia
 - 4. In South Asia
 - 5. In Southeast Asia
- H. In sub-Saharan Africa
 - 1. In the western Sudan
 - 2. In the eastern Sudan
 - 3. On the Guinea coast
 - 4. In the Congo
 - 5. In central and lower East Africa
 - 6. In the East African Horn
 - 7. In southern Africa
- I. In Oceania
 - 1. In Australia
 - 2. In Melanesia
 - 3. In Polynesia
 - 4. In Micronesia

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the peoples and cultures of the world

Africa	Eastern Africa
American Peoples, Native	Europe
Arctic, The	North Africa
Asia	Pacific Islands
Asian Peoples and Cultures	Transcaucasia
Australia	West Indies
Central Africa	Western Africa
Central Asia	
Culture, The Concept and Components of	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>Africa—Congo:</i>	Baule	Baster	Tembu
Ambo	Dan	Bergdama	Tonga
Azande	Edo	Chaga	Toro
Bemba	Efik	Chewa	Tsonga
Bulu	Ekoi	Ganda	Tswana
Chokwe	Ewe	Gusii	Turkana
Duala	Fanti	Ha	Tutsi
Fang	Fon	Haya	Venda
Ila	Ga	Hehe	Xhosa
Kaonde	Guro	Herero	Zaramo
Kongo	Ibibio	Hutu	Zulu
Kuba	Idoma	Kamba	<i>Africa—Sudan:</i>
Lozi	Igbira	Karamojong	Baga
Luba	Igbo	Khoikhoi	Bagirmi
Lunda	Ijo	Kikuyu	Bambara
Mangbetu	Isoko	Kipsikis	Bamileke
Maravi	Itsekiri	Lango	Bamum
Mbundu	Kissi	Lovedu	Banda
Mbuti	Kpelle	Luguru	Baqqarah
Mongo	Kru	Luhya	Bari
Ovimbundu	Lamba	Luo	Baya
Tabwa	Mamprusi	Luvale	Bobo
Yaka	Mbembe	Makonde	Bongo
Yao	Mende	Manyika	Dagomba
Yaunde	Nupe	Masai	Dinka
<i>Africa—Ethiopian</i>	Temne	Mfengu	Dogon
<i>and Somali:</i>	Tiv	Mpondo	Fali
Afar	Urhobo	Nandi	Fulani
Amhara	Yako	Ndebele	Fur
Gurage	Yoruba	Ngoni	Grusi
Konso	<i>Africa—Malagasy:</i>	Nguni	Guang
Oromo	Antaimoro	Nkole	Gurma
Saho	Antandroy	Nsenga	Hausa
Sidamo	Bara	Nyakyusa	Igala
Somali	Betsileo	Nyamwezi	Kababish
Tigray	Merina	Nyika	Kanuri
Tigre	Sakalava	Nyoro	Lala
<i>Africa—Guinea</i>	Tanala	Pedi	Lotuko
<i>Coast:</i>	Tsimihety	San	Lugbara
Adangme	<i>Africa—southern and</i>	Sandawe	Madi
Akan	<i>lower eastern:</i>	Shona	Malinke
Anyi	Acholi	Soga	Mande
Ashanti	Anuak	Sotho	Mossi
Baga	Bantu peoples	Swazi	Ngbandi

- | | | | |
|-------------------------|------------------------|-------------------|---------------------------|
| Nilot | Balochi | Balinese | Fleming and |
| Nuba | Bhīl | Batak | Walloon |
| Nuer | Bhutia | Bisaya | Germanic peoples |
| Sara | Brahui | Buginese | Gypsy |
| Senufo | Chakma | Cebuano | Hungarian |
| Serer | Chenchu | Cham | Mari |
| Songhai | Chin | Dayak | Mordvin |
| Tuareg | Dafla | Dusun | Sami |
| Tukulor | Durrānī | Ifugao | Slav |
| Wolof | Ghilzay | Igorot | Sorb |
| Zerma | Gond | Ilocano | Szekler |
| <i>Arctic:</i> | Gurung | Jakun | Tatar |
| Aleut | Ḥazāra | Javanese | Vlach |
| Chukchi | Ho | Kachin | Wend |
| Dolgan | Indus civilization | Karen | See also |
| Eskimo | Jāt | Kayan | Section 514 |
| Even | Kadar | Kenyah | <i>Middle America and</i> |
| Evenk | Khāsi | Khmer | <i>northern Andes:</i> |
| Itelmen | Khond | Kubu | Achagua |
| Ket | Koch | Lampung | Amuzgo |
| Khanty and Mansi | Koli | Madurese | Arawak |
| Komi | Korku | Magindanao | Cakchiquel |
| Koryak | Kota | Malay | Caquetío |
| Nenets | Kurumba | Manggarai | Cayapa |
| Nivkh | Lepchā | Maranao | Cenú |
| Sami | Limbu | Miao (Hmong) | Chatino |
| Yakut | Magar | Minahasan | Chinantec |
| Yukaghir | Marma | Minangkabau | Chocho |
| <i>Asia—Central and</i> | Mina | Mon | Chocó |
| <i>East:</i> | Mishmi | Montagnard | Chol |
| Ainu | Mizo | Moro | Chontal |
| Ami | Munda | Muong | Chortí |
| Buryat | Nāga | Murut | Ciboney |
| Chahar | Newar | Ngada | Colorado |
| Chuang | Nūristāni | Palaung | Cuicatec |
| Daghur | Pahārī | Pangasinan | Cumanagoto |
| Hani | Pashtun | Rejang | Cuna |
| Hui | Rai | Samal | Goajiro |
| Kalmyk | Sansi | Sasak | Guaymí |
| Kazak | Santhāl | Semang | Huastec |
| Khalkha | Savara | Senoi | Huichol and Cora |
| Kyrgyz | Sinhalese | Shan | Ixcatec |
| Oyrat | Tamāng | Sikanese | Jicaque |
| Pai | Tamil | Sundanese | Kekchí |
| Puyi | Tharu | Tagalog | Lacandón |
| Sanka | Toda | Tai | Lenca |
| She | Vedda | Tasaday | Maya |
| Tajik | <i>Asia—South</i> | Tau Sug | Mayo |
| Tibetan | <i>Siberian:</i> | Tenggerese | Mazatec |
| T'u-chia | Buryat | Toradja | Mesoamerican |
| Tung | Khakass | Wa | civilization |
| Turkic peoples | Khanty and Mansi | <i>Europe:</i> | Miskito |
| Turkmen | Nenets | Abkhaz | Mixe-Zoquean |
| Tuvan | Oyrat | Balt | Mixtec |
| Uighur | Tofalar | Bashkir | Nahua |
| Uzbek | Tuvan | Basque | Otomí |
| Yao | Uighur | Bulgar | Páez |
| Yi | Yakut | Caucasian peoples | Palenque |
| <i>Asia—South:</i> | <i>Asia—Southeast:</i> | Celt | Patángoro |
| Afrīdī | Achinese | Chuvash | Pijao |
| Andamanese | Arakanese | Circassian | Popoloca |
| Badaga | Atoni | Finnic peoples | Puruhá |

Quiché	Illinois	Atsina	Beaver
Sumo	Kickapoo	Blackfoot	Beothuk
Taino	Mahican	Cheyenne	Carrier
Tairona	Malecite	Comanche	Chipewyan
Tarasco	Massachuset	Crow	Cree
Tepehuan	Menominee	Hidatsa	Dogrib
Tojolabal	Miami	Kansa	Ingalik
Totonac	Mohawk	Kiowa	Kutchin
Tzeltal	Mohegan	Mandan	Micmac
Tzotzil	Montauk	Omaha	Montagnais and
Tzutujil	Nanticoke	Osage	Naskapi
Yaqui	Narraganset	Oto	Sekani
Yucatec Maya	Nauset	Ponca	Slave
Zapotec	Neutral	Sarcee	Tahltan
<i>Middle East and</i>	Nipmuc	Sioux	Tanaina
<i>North Africa:</i>	Ojibwa	Tonkawa	Tanana
Arab	Oneida	Wichita	<i>Oceania:</i>
Armenian	Ottawa	<i>North America—</i>	Aranda
Bakhtyārī	Pamlico	<i>Plateau:</i>	Australian
Balochi	Passamaquoddy	Flathead	Aborigine
Baqqārah	Pennacook	Kutenai	Chamorro
Bedouin	Penobscot	Modoc and	Hawaiian
Beja	Pequot	Klamath	Kariera
Berber	Potawatomi	Nez Percé	Maori
Cuman	Powhatan	Sahaptin	Trobriander
Druze	Sauk	Salish	<i>South America—</i>
Ḥarāṭīn	Seneca	Yakima	<i>central and southern</i>
Kabābīsh	Shawnee	<i>North America—</i>	<i>Andean:</i>
Kabyle	Susquehanna	<i>Southeast:</i>	Andean
Kurd	Tionontati	Apalachee	civilization
Lur	Tuscarora	Caddo	Araucanian
Rif	Wampanoag	Calusa	Atacama
Shawia	Wappinger	Catawba	Aymara
Teda	Wendat	Cherokee	Chavín
Tuareg	Wenrohronon	Chickasaw	Chimú
Turkmen	Winnebago	Chitimacha	Diaguita
<i>North America—</i>	<i>North America—</i>	Choctaw	Inca
<i>Californian:</i>	<i>Great Basin:</i>	Creek	Mapuche
Cahuilla	Bannock	Natchez	Quechua
Chumash	Mono	Seminole	<i>South America—</i>
Diegueño	Paiute	<i>North America—</i>	<i>nomadic:</i>
Juaneño	Shoshoni	<i>Southwest:</i>	Abipón
Luiseño	Ute	Apache	Chono
Maidu	Washo	Chiricahua	Guató
Mission Indians	<i>North America—</i>	Hopi	Makú
Miwok	<i>Northwest</i>	Jicarilla Apache	Mataco
Pomo	<i>Coast:</i>	Karankawa	Mbayá
Serrano	Bella Coola	Mescalero	Ona
Shastan	Chinook	Mimbres	Puelche
Wintun	Coast Salish	Mojave	Purí and
Yana	Haida	Navajo	Coroado
Yokuts	Hupa	Papago	Querandí
Yuki	Kwakiutl	Pima	Sirionó
<i>North America—</i>	Nootka	Pueblo Indians	Tehuelche
<i>Eastern Woodland:</i>	Tlingit	Shoshoni	Warrau
Abnaki	Tsimshian	Southwest	Yámana
Cayuga	Wiyot	Indian	Yaruro
Conoy	Yurok	Yuman	<i>South America—</i>
Delaware	<i>North America—</i>	Zuni	<i>tropical forest</i>
Erie	<i>Plains:</i>	<i>North America—</i>	Apapocuya
Fox	Arapaho	<i>Sub-Arctic:</i>	Bororo
Huron	Arikara	Algonquin	Botocudo
	Assiniboin		

Canelo
Carajá
Ge
Guaraní
Jívaro

Maxakali
Mura
Shavante
Sherente

Shipibo
Tucuna
Tupian
Tupinambá

Witoto
Yanomami

Biographies

See Section 10/36 of Part Ten

INDEX: See entries under all of the terms above

Section 512. The Development of Human Culture

A. Diverse theories of culture: conceptions involved in the analysis of culture

1. Definitions of culture
2. Culture and personality
3. Cultural comparisons: ethnocentrism, cultural relativism
4. Cultural adaptation and change
5. Cultural patterns
6. Cultural institutions
[see 513]

B. Types of cultures

1. Cultures of primitive and nonurban societies
 - a. Cultures of nomadic and settled hunters and gatherers
 - b. Horticultural societies: societies in which primitive agriculture is supplemental to hunting and gathering
 - c. Cultures of pastoralists and herdsmen: distribution and characteristics
 - d. Cultures of peasants and settled agriculturists
2. Cultures of civilized societies: theories of their origin and evolution
3. The development of modern industrial civilization: mass society

C. Processes of cultural change

[see Division II, below]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the development of human culture

Culture, The Concept and Components of
Modernization and Industrialization

Social Sciences, The
Social Structure and Change

MICROPAEDIA: Selected entries of reference information

General subjects

acculturation
age-area hypothesis
cultural evolution
culture
culture-and-
personality
studies
culture area

environmentalism
folk society
Gemeinschaft and
Gesellschaft
hunting and
gathering society
hydraulic
civilization

industrialization
Kulturkreis
Mesolithic Period
modernization
Neolithic Period
nomadism
Paleolithic Period

peasant
primitive culture
region
social Darwinism
survival
transhumance
urban revolution

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INDEX: See entries under all of the terms above

Section 513. Major Cultural Components and Institutions of Human Societies

- A. Systems of relationship based upon marriage and descent: kinship
 1. General aspects of kinship
 2. Laws and customs regarding mate selection, sexual behaviour, marriage and divorce, legitimacy [see also 553.B.]
 3. Rules of residence: *e.g.*, virilocal, uxorilocal, neolocal
 4. Descent systems: unilineal, cognatic, and variant forms
 5. Control of resources, inheritance, and succession: the family as a centre for transmission of economic, religious, political, and other powers and goods
 6. Kinship and social change: kinship as an evolving social institution
- B. Other social structures
 1. The varieties of groups and other associations within societies
 2. Organization by status: class systems, caste systems, systems characterized by slavery or serfdom
- C. Types of economic systems
 1. The economic systems of primitive or nonurban peoples
 - a. Production, division of labour, role differentiation
 - b. Exchange of goods, distribution of wealth
 - c. Property and property rights
 2. The economic systems of developed nations [see Division III, below]
- D. Other elements common to all cultures but differing in expression or practice between cultures
 1. Education and socialization: formal and informal enculturation
 2. Religious belief, folklore [for religious belief, see 811]
 3. Legal systems [see 551.B.]
 4. Artistic expression: literature, visual arts, performing arts; crafts [see 611, 612, and 613]
 5. Linguistic systems [see 514]
 6. Recreation, sports and games
 7. Passage and purification rites: birth, puberty, marriage, death

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with major cultural components and institutions of human societies

Culture, The Concept and Components of
 Family and Kinship
 Inheritance and Succession
 Social Sciences, The
 Sports, Major Team and Individual

MICROPAEDIA: Selected entries of reference information

General subjects

<i>kinship:</i>	clan	joint family	nuclear family
avoidance	cross-cousin	kin	patriarchy
relationship	descent	kinship	phratry
avunculate	extended family	kinship terminology	tribe
band	family	lineage	
blood brotherhood	gens	matriarchy	

<i>marital and sexual relationships:</i>	exchange marriage	<i>primitive economic systems:</i>	number game
betrothal	exogamy and endogamy	barter	serfdom
bridewealth	group marriage	gift exchange	slavery
circumcision	henogamy	kula	social class
clitoridectomy	incest	potlatch	social group
concubinage	levirate	silent trade	social status
couvade	residence	<i>other:</i>	Sporting Record
divorce	seigneur, droit du	card game	sports and games
dowry	sororate	caste	See also Sections 522 and 523
dual organization	tree marriage	children's game	

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INDEX: See entries under all of the terms above

Section 514. Language and Communication

- A. Communication as a foundation of human culture and as the essential element in social and cultural interaction, the role of communication in the modification of human behaviour
- B. Nonverbal communication
 1. Communication by means of bodily gestures and posture, by facial expression
 2. Laughter and nonword sounds as communication
 3. The use of signals, signs, symbols, icons, and cultural artifacts
 4. Cybernetic communication: computer languages, human language-computer interfaces, and artificial intelligence and expert systems
 5. Parapsychological forms of communication: telepathy
[see 432.H.]
- C. The nature of language
 1. Definitions of language
 2. Ways of studying language: phonetics, grammar, semantics
 3. Language variants: dialects, slang, and specialized variants (*e.g.*, jargon, pidgins, creoles)
 4. Speech: the psychological and physiological bases
 5. Meaning and style in language: structural and lexical meanings; semantic flexibility; language and conceptualization; style
 6. Language and culture: transmission of language; language and social differentiation; control of language for cultural ends; language learning and literacy; written language and spoken language
 7. Linguistic change and language typology
 8. Cryptology: codes, ciphers, and other means of encrypting language
- D. The structure of speech and language
 1. The phonetics of speech (articulatory, acoustic, linguistic); phonetic transcription; experimental phonetics
 2. The physiology of speech: regulators (respiratory and brain functions); the larynx; voice production (including synthetic voice production)
 3. Speech disorders
- E. Written language: systems of notation
 1. The nature, origin, and evolution of writing: from pictures to the alphabet

2. Types of writing systems: logographic, syllabic, consonantal, alphabetic, featural
 3. Systems of writing: hieroglyphic, cuneiform, alphabetic, ideographic
 4. Adjuncts to writing: punctuation, shorthand
 5. Calligraphy and the art of handwriting: early Semitic, Arabic, Greek, Latin, Indic, East Asian
- F. Linguistics: the scientific study of language and language development
[see also 10/36 H.]
1. The development of linguistic theory
 2. Synchronic linguistics: structural, transformational-generative grammar, tagmemics, stratificational grammar, the Prague school
 3. Diachronic linguistics: linguistic change, comparative method, language classification
 4. Dialectology and the study of linguistic geography
 5. Semantics: the study of language and meaning
 6. The study of writing
 7. The classification of language
- G. Language and society
1. Attitudes toward language: taboos in language use, myths about the origin of language, the relation of language and thought
 2. The connection of language with history, the role of language in the transmission of culture
 3. The role of language in cross-cultural relations
 4. The use of language as a political instrument
 5. The role of language in unifying social and occupational groups
- H. Languages of the world
1. Indo-European languages
 - a. Anatolian
 - b. Indo-Iranian
 - c. Greek
 - d. Italic
 - e. Romance
 - f. Germanic
 - g. Armenian
 - h. Tocharian
 - i. Celtic
 - j. Baltic
 - k. Slavic
 - l. Albanian
 2. Uralic languages
 - a. Finno-Ugric
 - b. Samoyedic
 3. Altaic languages
 - a. Turkic
 - b. Mongolian
 - c. Manchu-Tungus
 4. Dravidian languages
 - a. South Dravidian

- b. Central Dravidian
 - c. North Dravidian
- 5. Austroasiatic languages
 - a. Mon-Khmer
 - b. Munda
- 6. Sino-Tibetan languages
 - a. Chinese
 - b. Tibetic
 - c. Burmic
 - d. Baric
 - e. Karenic
- 7. Hmong-Mien (Miao-Yao) language
- 8. Tai languages
 - a. Southwestern Tai
 - b. Central Tai
 - c. Northern Tai
- 9. Paleo-Siberian languages
 - a. Nivkh
 - b. Yukaghir
 - c. Chukchi
 - d. Koryak
 - e. Itelmen
 - f. Ket
- 10. Caucasian languages
 - a. South Caucasian
 - b. North Caucasian
- 11. Afro-Asiatic languages
 - a. Semitic
 - b. Egyptian
 - c. Berber
 - d. Cushitic
 - e. Chadic
- 12. Korean language
- 13. Japanese language
- 14. Austronesian languages
 - a. Formosan
 - b. Western Malayo-Polynesian
 - c. Central Malayo-Polynesian
 - d. South Halmahera–West New Guinea
 - e. Oceanic
- 15. Papuan languages
- 16. Australian Aboriginal languages
- 17. African languages
 - a. Niger-Congo
 - b. Chari-Nile and Nilo-Saharan
 - c. Khoisan

18. Indian languages of North America
 - a. Eskimo-Aleut
 - b. Na-Dené
 - c. Macro-Algonquian
 - d. Macro-Siouan
 - e. Hokan
 - f. Penutian
 - g. Aztec-Tanoan
19. Indian languages of Meso-America
 - a. Uto-Aztecan
 - b. Tequistlatec
 - c. Tlapanec
 - d. Oto-Pamean
 - e. Popolocan
 - f. Mixtecan
 - g. Zapotecan
 - h. Chinantecan
 - i. Mixe-Zoque
 - j. Totonacan
 - k. Mayan
 - l. Misumalpan
20. Indian languages of South America and the Caribbean
 - a. Arawakan
 - b. Cariban
 - c. Macro-Chibchan
 - d. Macro-Ge
 - e. Macro-Pano-Tacanan
 - f. Quechumaran
 - g. Tucanoan
 - h. Tupian
21. Language isolates
 - a. Sumerian
 - b. Etruscan
 - c. Basque
22. Pidgins and creoles
23. Constructed languages
 - a. Special international or universal languages, including Esperanto and Interlingua; Basic English
 - b. Machine languages: *e.g.*, Fortran, Algol
[see 735.D.3.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with language and communication

Communication	Linguistics
Cryptology	Names
Humour and Wit	Speech
Language	Writing
Languages of the World	

MICROPAEDIA: Selected entries of reference information

General subjects

- alphabets and other writing systems:*
 alphabet
 Arabic alphabet
 Aramaic alphabet
 Armenian alphabet
 Brāhmī
 Braille
 Canaanite inscriptions
 Chinese writing system
 cuneiform writing
 Cypriot syllabary
 Cyrillic alphabet
 demotic script
 Devanāgarī
 Eggjum Stone
 Ethiopic alphabet
 Etruscan alphabet
 Glagolitic alphabet
 Gothic alphabet
 Grantha alphabet
 Greek alphabet
 Gregg shorthand
 Gupta script
 Gurmukhī alphabet
 Hangul
 Hebrew alphabet
 hieroglyph
 Hittite hieroglyphic writing
 Iguvine Tables
 Indic writing systems
 kana
 Kensington Stone
 Kharoṣṭī
 Kōk Turki alphabet
 Latin alphabet
 Linear A and Linear B
 Mayan hieroglyphic writing
 Myazedi inscription
 Nabataean alphabet
 North Semitic alphabet
 ogham writing
 Pahlavi alphabet
 Palmyrenian alphabet
 Phoenician alphabet
- pictography
 Pitman shorthand
 Rosetta Stone
 runic alphabet
 Sarada script
 shorthand
 Sinaitic inscriptions
 South Semitic alphabet
 Speedwriting
 stenotypy
 syllabary
 Syriac alphabet
 Ugaritic alphabet writing
- grammar, syntax, and vocabulary:*
 abbreviation
 agglutination
 auxiliary
 gender
 grammar
 honorific
 mood
 morpheme
 name
 patronymic
 punctuation
 slang
 speculative grammar
 surname
 syntax
 tense
 voice
- languages—*
African:
 African languages
 Bantu languages
 Central Sudanic languages
 Eastern Sudanic languages
 Khoikhoi languages
 Khoisan languages
 Kwa languages
 Meroitic language
 Niger-Congo languages
 Nilotic languages
 Nubian languages
 San languages
 Swahili language
 West Atlantic languages
 Xhosa language
 Zulu language
- languages—*
Afro-Asiatic (Hamito-Semitic):
 Afro-Asiatic languages
 Akkadian language
 Amharic language
 Arabic language
 Aramaic language
 Berber languages
 Chadic languages
 Coptic language
 Cushitic languages
 Eblaite language
 Egyptian language
 Ge'ez language
 Hausa language
 Hebrew language
 Phoenician language
 Semitic languages
 South Arabic language
 Syriac language
- languages—Altaic:*
 Altaic languages
 Chuvash language
 Evenk language
 Kazak language
 Kyrgyz language
 Manchu language
 Manchu-Tungus languages
 Mongol language
 Mongolian languages
 Tatar language
 Turkic languages
 Turkish language
 Turkmen language
 Uighur language
 Ural-Altaic languages
 Uzbek language
- languages—*
Austroasiatic:
 Austroasiatic languages
 Khmer language
 Mon-Khmer languages
 Munda languages
 Nicobarese languages
 Vietnamese language
- languages—*
Austronesian:
 Austronesian languages
- Cebuano
 Fijian language
 Formosan languages
 Javanese language
 Malagasy languages
 Malay language
 Melanesian languages
 Micronesian languages
 Oceanic languages
 Philippine languages
 Polynesian languages
 Tagalog language
- languages—*
Caucasian:
 Avar-Andi-Dido languages
 Caucasian languages
 Georgian language
 Kartvelian languages
 Laz language
 Mingrelian language
 Nakh languages
- languages—*
Dravidian:
 Dravidian languages
 Kannada language
 Malayalam language
 Tamil language
 Telugu language
- languages—Indo-European (Baltic):*
 Baltic languages
 Latvian language
 Lithuanian language
 Old Prussian language
- languages—*
Indo-European (Celtic):
 Breton language
 Brythonic languages
 Celtic languages
 Cornish language
 Goidelic languages
 Irish language
 Pictish language

- Scottish Gaelic language
 Welsh language
languages—
Indo-European
 (Germanic):
 Afrikaans language
 Danish language
 English language
 Faroese language
 Frisian language
 German language
 Germanic languages
 Gothic language
 Icelandic language
 Luxemburgian language
 Middle English language
 Netherlandic language
 Norwegian language
 Old English language
 Old Norse language
 Old Saxon language
 Scandinavian languages
 Scots language
 Swedish language
 Swiss German language
 Yiddish language
languages—
Indo-European
 (Greek):
 Demotic Greek language
 Greek language
 Katharevusa Greek language
 Koine
languages—
Indo-European
 (Indo-Iranian):
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 Assamese language
 Avestan language
 Balochi language
 Bengali language
 Bihārī languages
 Burushaski language
 Dardic languages
 Dari language
 Gujarati language
 Hindi language
 Hindustani language
 Indian languages
 Indo-Aryan languages
 Indo-Iranian languages
 Iranian languages
 Kashmiri language
 Marāṭhī language
 Oṛiyā language
 Ossetic language
 Pahari languages
 Pashtawī language
 Pāli language
 Parthian language
 Pashto language
 Persian language
 Prakṛit languages
 Punjābī language
 Romany language
 Sanskrit language
 Sindhi language
 Sinhalese language
 Urdu language
languages—
Indo-European
 (Romance and Italic):
 Catalan language
 Franco-Provençal dialect
 French language
 Italian language
 Italic languages
 Ladino language
 Latin language
 Mozarabic language
 Occitan language
 Oscan language
 Oscan-Umbrian languages
 Portuguese language
 Rhaetian dialects
 Romance languages
 Romanian language
 Sabellic dialects
 Sardinian language
 Spanish language
 Umbrian language
 Vulgar Latin
languages—
Indo-European
 (Slavic):
 Belarusian language
 Bulgarian language
 Czech language
 Lekhitic languages
 Macedonian language
 Old Church Slavonic language
 Polish language
 Russian language
 Serbo-Croatian language
 Slavic languages
 Slovak language
 Slovene language
 Sorbian languages
 Ukrainian language
languages—
Indo-European
 (other):
 Albanian language
 Anatolian languages
 Armenian language
 Hittite language
 Indo-European languages
 Indo-Hittite languages
 Luwian language
 Lydian language
 Raetian language
 Tocharian languages
languages—
international and artificial:
 Basic English
 Esperanto
 Ido
 Interlingua
 Novial
 Volapük
languages—
Meso-American
Indian:
 American Indian languages
 Cakchiquel language
 Maya languages
 Mixe-Zoque languages
 Nahuatl language
 Oto-Manguean languages
 Quiché language
 Uto-Aztecan languages
 Yucatec language
languages—North American Indian:
 Algonquian languages
 American Indian languages
 Cherokee language
 Eskimo-Aleut languages
 Hokan languages
 Hopi language
 Macro-Algonquian languages
 Macro-Siouan languages
 Na-Dené languages
 Navajo language
 Penutian languages
 Siouan languages
languages—pidgin and auxiliary:
 Chinese Pidgin English creole
 Gullah
 Haitian Creole
 lingua franca
 Melanesian Pidgin
 Papiamentu
 pidgin
 Sranantonga
languages—
Sino-Tibetan
 Burmese language
 Cantonese language
 Chinese languages
 Kan-Hakka languages
 Karen languages
 Mandarin language
 Miao-Yao (Hmong-Mien) languages
 Min languages
 Pinyin romanization
 Sino-Tibetan languages
 Tibetan language
 Wade-Giles romanization
 Wu language
languages—South American Indian
 American Indian languages
 Arawakan languages

- | | | | |
|-------------------------------|--------------------------|-------------------|----------------|
| Quechuan languages | <i>languages—Uralic:</i> | glossematics | consonant |
| Tupí-Guaraní | Estonian language | glottochronology | inflection |
| languages | Finnish language | Grimm's law | International |
| <i>languages—Tai:</i> | Finno-Ugric | historical | Phonetic |
| Shan language | languages | linguistics | Alphabet |
| Tai languages | Hungarian | immediate | intonation |
| Thai language | language | constituent | nasal |
| <i>languages—</i> | Karelian language | analysis | palatalization |
| <i>unaffiliated</i> | Mari language | koine | phoneme |
| (<i>extinct</i>): | Mordvin language | linguistics | phonetics |
| Elamite language | Permic languages | morphology | phonology |
| Etruscan language | Sami languages | Neogrammarian | rounding |
| Hattic language | Ural-Altaic | neurolinguistics | stop |
| Hurrian language | languages | Prague school | suprasegmental |
| Sumerian language | Uralic languages | psycholinguistics | tone |
| <i>languages—</i> | <i>linguistics:</i> | semantics | velarization |
| <i>unaffiliated (living):</i> | anthropological | semiotics | voice |
| Andamanese | linguistics | sociolinguistics | vowel |
| language | comparative | structuralism | <i>other:</i> |
| Australian | linguistics | stylistics | communication |
| Aboriginal | computational | synchronic | cryptology |
| languages | linguistics | linguistics | humour |
| Basque language | dialect | transformational | name |
| Japanese language | dialectology | grammar | semaphore |
| Ket language | diglossia | Verner's law | sign language |
| Korean language | ethnolinguistics | <i>phonetics:</i> | speech |
| Maori language | etymology | accent | symbol |
| Paleo-Siberian | general semantics | allophone | |
| languages | generative | articulation | |
| Papuan languages | grammar | click | |
- Biographies**
- | | | | |
|-----------------|-------------------|--------------------|--------------------|
| Apollonius | Grimm, Jacob | Levita, Elijah | Sibawayh |
| Dyscolus | Ludwig Carl and | Pike, Kenneth L. | Trubetskoy, |
| Bloomfield, | Wilhelm Carl | Priscian | Nikolay |
| Leonard | Halliday, M.A.K. | Rask, Rasmus | Sergeyevich |
| Chomsky, Noam | Harris, Zellig S. | Sapir, Edward | Ulfilas |
| Cyril and | Humboldt, | Saussure, | Vaugelas, Claude |
| Methodius, | Alexander von | Ferdinand de | Favre, seigneur de |
| Saints | Jakobson, Roman | Scaliger, Joseph | Whorf, |
| Donatus, Aelius | Jespersen, Otto | Justus | Benjamin Lee |
| Firth, John R. | Kimhi, David | Schleicher, August | |

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Division II. Social Organization and Social Change

[For Part Five headnote see page 173.]

The outlines in the four sections of Division II present general sociological theories of social order and social change, and sociological studies of basic social institutions, social processes, and social problems.

Section 521. Social Structure and Change 186

522. The Group Structure of Society 188

523. Social Status 189

524. Human Populations: Urban and Rural Communities 190

Section 521. Social Structure and Change

A. The structure of society: diverse theories of social structure and organization, various types of social structure

- B. The social effects of bureaucratic and industrial specialization
 - 1. The social effects of industrialization and modernization
 - 2. The social effects of organizational specialization: bureaucracy
 - 3. The social effects of industrial specialization and automation
[see also 712.C.]
- C. Social control
 - 1. The process of socialization: the transmission of patterns of normative behaviour by family, peer groups, and education
 - 2. Theories of alienation: definitions, causes, manifestations, and proposed solutions
 - 3. The regulation of behaviour that departs from social norms
 - a. By punishment, rehabilitation, and reform of criminals
 - b. By psychological therapy
 - c. By persuasion
- D. Factors operative in social change
 - 1. The role of ideology in social change
 - 2. Contact with other cultures as a factor in social change
 - 3. The influence of environment as a factor in social change
 - 4. The role of demographic factors in social change
 - 5. The role of art in social change: art as an ideological instrument
 - 6. Religion as a factor for and against social change
 - 7. The role of intellectual factors in social change
 - 8. The relationship of economic factors to social stability
 - 9. Technological factors in social change
 - 10. The role of collective behaviour in social change
 - 11. The role of public opinion in social behaviour
- E. Social movements and social change
 - 1. Characteristics of social movements
 - 2. Selected types of social movements
 - a. Movements centred on religious concepts or personalities
 - b. Humanitarian and reform movements
 - c. Interest group movements
 - d. Revolutionary movements
 - e. Nationalist movements
[see also 541.C.3.b.vii.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with social structure and change

Collective Behaviour	Public Opinion
Crime and Punishment	Social Sciences, The
Modernization and Industrialization	Social Structure and Change
Propaganda	Work and Employment

MICROPAEDIA: Selected entries of reference information

General subjects

<i>punishment and rehabilitation:</i>	Auburn system	commutation	exile and
amnesty	Baumes Laws	deportation	banishment
	Borstal system	Elmira system	

indeterminate sentence	punishment	social change	collective
mark system	recidivism	social Darwinism	behaviour
ostracism	reformatory	social movement	folkway
parole	torture	temperance movement	norm
penal colony	workhouse	<i>social norms</i>	public opinion
Pennsylvania system	<i>social change:</i>	<i>and associated phenomena:</i>	role
prison	civil disobedience	assimilation	social structure
probation	sanction		
	satyāgraha		
	sit-in		

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Section 522. The Group Structure of Society

A. The various types of groups: patterns of group relations

1. Classifications of groups
2. The modern family: its organization and functions
3. Special-interest groups
[see also 541.B.3.]
4. Minorities and ethnic groups

B. The social effects of racial and ethnic prejudice

C. Special social concerns

1. Adolescence
2. Old age
3. Women's social and legal status
4. Cultural minorities
[see A.4., above]
5. Poverty
6. Criminality and delinquency
7. Sexual orientation
8. Prostitution
9. Drug and alcohol abuse
10. Suicide

D. Social service: organized public and private activities to alleviate human wants and needs

1. The background of social and welfare services: modern and historical influences
2. Fields of service
 - a. Family welfare
 - b. Child welfare
 - c. Youth welfare
 - d. Group welfare
 - e. Disaster relief
 - f. Community development
 - g. Medical and psychiatric social services
 - h. School social services
[see also 561.C.4.]
 - i. Correctional services: probation, parole, and delinquency control

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the group structure of society

Alcohol and Drug Consumption	Social Sciences, The
Crime and Punishment	Social Welfare
Family and Kinship	
Sex and Sexuality	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>family and marriage:</i>	polyandry	<i>social legislation and</i>	crime
adoption	polygamy	<i>social services:</i>	delinquency
betrothal	surrogate	affirmative action	drug abuse
bridewealth	motherhood	almoner	habitual offender
divorce	<i>interest groups and</i>	almshouse	old age
dowry	<i>social movements:</i>	child welfare	organized crime
exchange marriage	black nationalism	philanthropic	poverty
exogamy and	Civil Rights	foundation	prostitution
endogamy	Movement	prohibition	racial segregation
family	ethnic group	service club	racism
group marriage	interest group	social service	suicide
henogamy	lobbying	social settlement	white-collar crime
joint family	minority	social welfare	<i>other:</i>
levirate	temperance	program	assimilation
marriage	movement	woman suffrage	charisma
nuclear family	women's liberation	<i>social problems:</i>	Gemeinschaft and
parent	movement	alcoholism	Gesellschaft
		child abuse	

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Section 523. Social Status**A. Social differentiation and stratification**

1. The concepts of differentiation and stratification: distinctions and interrelationships
2. Factors producing social, economic, and cultural differences: sex differentiation, age differentiation, racial differentiation, intellectual differentiation, social and cultural factors [see 521.D.]
3. The process of stratification: its relationship to differentiation
 - a. Economic differentiation: the basis of stratification
 - b. Class, status, and power as forms of stratification
 - c. The relation of the individual to society: the effects of differentiation and stratification

B. Varieties of social stratification and social mobility

1. The relation of social class to caste, status, elites, and other concepts
2. Theories of social class: divergent conceptions of the importance of classes in social structures and of the nature of class relationships
3. Types and characteristics of and comparisons among modern social classes: upper class, working class, and middle class; the special case of the peasant class
4. Social mobility
5. The idea of a classless society: approximations to an equality of conditions
6. Social immobility: slavery, serfdom, and forced labour

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with social status

Slavery
Social Sciences, The

MICROPAEDIA: Selected entries of reference information

General subjects

<i>labour and servitude:</i>	serfdom	caste	racial segregation
abolitionism	slavery	clan	social class
contract labour	statute labour	ethnic group	social mobility
forced labour	<i>social differentiation,</i>	family	social status
freedman	<i>stratification, and</i>	ghetto	
labour, division of	<i>segregation:</i>	kinship	
migrant labour	age set	minority	
peonage	apartheid		

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Section 524. Human Populations: Urban and Rural Communities**A. The composition and change of human populations**

1. Determinants of population
 - a. Human fertility and its control
 - b. Mortality: death rates and longevity
 - c. Migration and refugee movements
2. Historical changes in population
3. Theories of population
 - a. Premodern beliefs: pronatalism versus birth control
 - b. Mercantilist theory
 - c. Laissez-faire theory
 - d. Malthusian theory
 - e. Marxist theory
 - f. Modern theories of population; *e.g.*, optimum population size, optimum rate of population growth, relationship between population and demographic movements
 - g. Ecological theories concerning the relationship between human population growth and the conservation of natural resources
4. Governmental policies influencing population growth and composition
5. The future of the world's population: population projections and problems of the population explosion

B. Development of modern cities

1. Characteristics of urbanization
2. History of urbanization
3. Patterns of urban planning
 - a. Methods and materials of urban planning and redevelopment
 - b. Social aspects of urban planning and redevelopment
4. Trends in urbanization
 - a. Megalopolis: the coalescence of several metropolitan areas into a contiguous agglomeration of people and activity

- b. Suburbanization: the growth of politically separate but economically dependent residential communities surrounding large cities
- c. Regional integration: economic and cultural interaction between the city and its hinterland
- d. The role of technology in extending the dominance and influence of urban concentrations
- e. Problems of urban growth and population control
- f. Problems of environmental change: pollution, climatic change

C. Development of modern rural societies

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with human populations: urban and rural communities

Birth Control

Cities

Climate and Weather

Modernization and Industrialization

Population

Social Sciences, The

MICROPAEDIA: Selected entries of reference information

General subjects

age distribution

birth control

census

city

contraception

demography

human migration

metropolitan area

mortality

new town

planned

parenthood

pollution

population

refugee

rural society

urban climate

urban planning

urban renewal

urbanization

vital rates

zoning

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Division III. The Production, Distribution, and Utilization of Wealth

[For Part Five headnote see page 173.]

The outlines in the seven sections of Division III deal with the economic order in human society.

Section 531. Economic Concepts, Issues, and Systems 191

532. The Consumer and the Market: Pricing and the Mechanisms for Distributing Goods 192

533. The Organization of Production and Distribution 194

534. The Distribution of Income and Wealth 198

535. Macroeconomics 199

536. Economic Growth and Planning 201

Section 531. Economic Concepts, Issues, and Systems

A. Some basic concepts of economics

1. The concept of economic activity as a process of choosing among scarce resources
2. The concept of division of labour
3. The concepts of diminishing returns and optimization
4. The concept of marginality
5. The concept of capital
6. The concept of competition
7. The concept of comparative advantage
8. The concepts of growth and development

B. Levels of economic analysis

1. Microeconomics: the economic decisions of individuals, households, and firms

2. Sectoral economics: the economic arrangements of industries, groups, and regions
 3. Macroeconomics: the economy as a whole
- C. The comparison of different economic systems
1. Archetypal economic systems
 - a. The pure private enterprise economy: a theoretical model
 - b. The centrally planned economy: the pure socialist model
 - c. The mixed economy with various degrees of economic planning
 2. Western-type market economies
 3. Soviet- and socialist-type economic systems
 4. Mixed economies in developing countries
 5. Other economic systems
 - a. Primitive economic systems
 - b. Feudal economic systems

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with economic concepts, issues, and systems

Economic Systems
Economic Theory

Government Finance
International Trade

MICROPAEDIA: Selected entries of reference information

General subjects

<i>economic concepts:</i>	marginal utility	communism	potlatch
capital	microeconomics	economic system	silent trade
diminishing	supply and	socialism	<i>other:</i>
returns, law of	demand	<i>primitive economic</i>	bourgeoisie
distribution theory	<i>economic systems:</i>	<i>activities:</i>	Gosplan
labour, division of	capitalism	barter	labour, hours of
laissez-faire	command	gift exchange	mercantilism
macroeconomics	economy	kula	proletariat
margin			

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See Section 10/36 of Part Ten

INDEX: See entries under all of the terms above

Section 532. The Consumer and the Market: Pricing and the Mechanisms for Distributing Goods

- A. Scarcity, utility, and value: their roles in pricing, their relationship to the consumer
- B. The satisfaction of material wants: the behaviour of consumers
1. National consumption levels in the private sector: trends in expenditures for goods and services
 2. Factors influencing consumers' tastes and spending
 3. The protection of consumer interests
- C. Markets as an economic institution in a mixed economy
1. Markets classified by reference to competition and monopoly
 - a. Purely competitive markets as distinguished from markets of imperfect competition: monopoly, oligopoly, and monopolistic competition
 - b. Influences affecting the behaviour of sellers under various competitive conditions
 - c. The concept of workable competition
 - d. Government regulation of monopolistic practices

2. Major types of markets

- a. Markets for primary commodities
- b. Markets for manufactured goods
- c. Markets for money and capital: the market for short-term loans, the securities market
- d. The market for labour and services
[see 533.C.1.]

3. The counterpart of the market under full-scale economic planning: markets under socialism

4. The historical development of markets: the market in economic theory, the relationship of the market to social welfare and politics

5. Markets in international trade
[see 533.F.]

6. The function of the market in the establishment of equilibrium between supply and effective demand

D. The price system in capitalist economies

1. The price system as a means of organizing economic activity: the determination of what is to be produced, how goods are to be produced, and who gets the product
2. Limitations on and failures of the price system: areas in which the price system does not function
 - a. Control of prices by business: price-fixing
[see C.1.a., above]
 - b. Government-established price controls and subsidies: regulations concerning public utilities and bank interest rates
[see 534.B.4.b., and 534.B.6.b.]
 - c. Economic relationships not susceptible to control by prices: "externalities," such as air pollution and highway congestion
[see also 737.C.1.]
 - d. Imperfect knowledge on the part of buyers as to alternative uses of their buying power
[see B.2., above]
3. The role of the public sector in the distribution of goods and services: government budgets
[see 534.B.1.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the consumer and the market: pricing and the mechanisms for distributing goods

Economic Theory
Government Finance
International Trade

Markets
Social Sciences, The

MICROPAEDIA: Selected entries of reference information

General subjects

<i>consumer protection:</i>	credit card	bazaar	market
antitrust law	demand curve	black market	marketing board
Better Business	indifference curve	cartel	monopolistic
Bureau	marginal utility	cobweb cycle	competition
consumerism	producer goods	commodity	monopoly
fair-trade law	propensity to	exchange	price
<i>consumption:</i>	consume	commodity	price
consumer good	supply and	trade	discrimination
consumer's surplus	demand	futures	price maintenance
consumption	<i>market organization</i>	hedging	rebate
consumption	<i>and pricing:</i>	marginal-cost	
function	auction	pricing	

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Section 533. The Organization of Production and Distribution

- A. The organization of the production of goods
 1. Analysis of costs and output in the short run: the production function, substitution, the relationship of marginal cost to market price, marginal product
 2. Analysis of costs and output in the long run for profit maximization and cost minimization
- B. The organization of the distribution of goods
 1. The relation between the productive process and the incomes derived from it
[see also 534.A.2. and A.3.b.]
 2. The earnings of land, labour, and capital employed in the productive process
- C. The inputs of the productive process
 1. Labour as an input in the productive process
 - a. The labour force: size, quality, and deployment of work force
 - b. Methods of fixing rates of pay
 - c. The structure of pay: differences in the earnings of various occupations
 - d. Changes in the general level of pay
 - e. Employment and unemployment
 - f. The economic and social status of temporary, seasonal migrant labourers
 - g. The organization of unions
 - h. The influence of the union on the supply of labour, wages, and output
 - i. Capital elements in labour: education and training
 - j. The economic role of managers and entrepreneurs
 2. Land and raw materials as inputs
 3. Energy as an input
 4. Capital as an input in the productive process
- D. Institutional arrangements that facilitate production and output
 1. The nature and characteristics of money
 - a. The basic functions of money
 - b. The various forms of money
 - c. The quantity theory of money: views of classical and neoclassical monetary theorists, views of Keynesian income theorists
 2. The monetary functions of commercial banks and central banks
 - a. Historical development of banking systems
 - b. The structure of modern national banking systems
 - c. Principles and functions of commercial banking systems
 - d. Principles and functions of central banking systems
 - e. The money market: various national and international markets for short-term funds
 - f. International monetary institutions: proposals for future monetary cooperation and an international currency unit
[see also 535.B.2.]
 - g. The market for long-term funds: savings institutions, the stock and bond markets, credit unions, mortgage institutions, farm cooperative banks, insurance institutions, mutual funds, pension funds
 - h. The nature and functions of government credit agencies
 3. The use of economic statistics in the determination of production and output
 - a. National income statistics

- b. Price statistics: the use and construction of indexes of retail and wholesale prices
 - c. Economic forecasting
- 4. The business corporation
- E. Agricultural economics
 - 1. The relationship between agricultural and economic development
 - 2. Efforts to control prices and production in agriculture: government price supports, subsidies, and acreage limitations
 - 3. The behaviour of farm prices and the consequences for the incomes of farmers
 - 4. The effect of technology on world agriculture: the increase in acreage and in crop yields
 - 5. The organization of farming: types of farms
- F. The geographical distribution of resources and markets: international trade
 - 1. Classical and contemporary theories of international and interregional trade
 - 2. National and regional factors influencing trade
 - a. Tariffs, embargoes, and quotas imposed to obtain revenue, protect domestic industry, and secure a favourable balance of payments
 - b. Changes in the conditions of production: costs, labour, and technology
 - c. Price movements
 - d. National domestic taxes and subsidies
[see also 534.B.4.]
 - 3. International trade arrangements
- G. The role of government in production and distribution
 - 1. The theory of public expenditures: the role of taxation in the budgetary process and problems of effective tax administration
 - 2. The justification of the government's claim to share in resource use: problems of balancing resource consumption between the public and private sectors
 - 3. The growth in government spending in the 19th and 20th centuries: the rise in military and social welfare expenditures
 - 4. Government operation of basic industries
- H. Methods of business organization
 - 1. The keeping of accounts
 - a. Accounting as an information system
 - b. Various types of company financial statements; *e.g.*, the balance sheet, the income statement
 - c. Principles of accounting measurement: asset and cost measurement
 - d. Cost accounting: formulation of budgetary plans, performance reports, profit analyses
 - 2. The management of business funds
 - a. Short-term and intermediate-term financial operations: planning and control, the cash budget, accounts receivable, inventories
 - b. Long-term financial operations: the design of capital structure and the issuance of securities
 - c. Consolidations and mergers
 - 3. The management of human resources: personnel administration
 - a. Personnel departments: their functions and services
 - b. Manpower planning, recruitment, and placement
 - c. Employee training and development
 - d. Methods of maintaining employee incentive and commitment
 - 4. The administration and control of production
 - a. The flow channels of information and materials
 - b. The control function: maintaining conformity between operations and the plan

- c. Production scheduling
 - d. Inventory adjustment
- 5. The distribution of goods
 - a. The functions of a marketing department in a large firm
 - b. Retailing
 - c. Wholesaling
 - d. Marketing goods to industry, marketing farm products
 - e. The application of market research techniques to merchandising
- I. Advertising
- J. The distribution of risk
 - 1. The nature of insurance
 - 2. Fire and marine insurance
 - 3. Casualty and surety insurance: liability insurance, theft insurance, aviation insurance, workmen's compensation or industrial injury insurance, credit insurance, title insurance, suretyship
 - 4. Private life and health insurance
 - 5. Government-sponsored and/or government-administered health insurance
[see 534.B.4.c.]
 - 6. Underwriting of risks: rate making
 - 7. Legal aspects of insurance
- K. Consumer credit
 - 1. Types of consumer credit: installment loans and noninstallment, or single-payment, loans
 - 2. Historical development of consumer credit in industrialized countries
 - a. Lending institutions and the question of interest rates
 - b. Costs and hazards of consumer credit
 - 3. Efforts to protect the consumer: the dimensions of consumer credit

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the organization of production and distribution

Accounting	Coins and Coinage	Insurance	Social Sciences, The
Banks and	Economic Growth	International Trade	Work and
Banking	and Planning	Marketing and	Employment
Business	Economic Theory	Merchandising	
Organization	Government	Markets	
	Finance	Money	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>agricultural</i>	bank	development bank	investment trust
<i>economics:</i>	bond	discount rate	liquidity preference
agricultural	business finance	dividend	marginal efficiency
economics	capital	exchange, bill of	of investment
extensive	central bank	Federal Deposit	money market
agriculture	commercial bank	Insurance	money order
intensive	consumer credit	Corporation	mutual fund
agriculture	credit	Federal Reserve	national bank
kolkhoz	credit, letter of	System	over-the-counter
tenant farming	credit card	finance company	market
<i>banking and</i>	credit union	installment credit	promissory note
<i>financing:</i>	deposit,	interest	revolving credit
acceptance	certificate of	investment	risk
arbitrage		investment bank	saving

savings and loan association	economic forecasting	vending machine	price discrimination
savings bank	economic indicator	wholesaling	price maintenance
security	income and employment theory	<i>money:</i>	production function
sinking fund	input-output analysis	bimetallism	production management
stock	Keynesian economics	bullionism	rent
stock exchange	Laspeyres index	check	resources, allocation of
stock option	multiplier	coin	supply curve
ticker	Paasche index	currency	
time deposit	Phillips curve	dollar	<i>work and employment:</i>
<i>business organization:</i>	price index	drachma	boycott
account payable	wholesale price index	ecu	child labour
account receivable	<i>insurance:</i>	Eurodollar	closed shop
amortization	actuary	fractional reserve system	collective bargaining
audit	annuity	franc	coolie
bookkeeping	casualty insurance	gold-exchange standard	enterprise unionism
cartel	fire insurance	gold reserve	featherbedding
chartered company	friendly society	gold standard	fringe benefit
clearinghouse	group insurance	Gresham's law	general strike
conglomerate	guaranty and suretyship	lira	guaranteed wage plan
corporation	health insurance	mark	industrial union
credit bureau	insurance	monetarism	labour
depletion	liability insurance	money	labour, hours of
allowance	life insurance	money supply	labour economics
depreciation	marine insurance	parity	labour law
industrial espionage	motor-vehicle insurance	peso	lockout
inventory	<i>markets, marketing, and merchandising:</i>	pound sterling	maquiladora
limited liability	advertising	quantity theory of money	mediation
mercantile agency	auction	ruble	migrant labour
merger	bazaar	rupee	minimum wage
monopoly	black market	seigniorage	pension
multinational corporation	chain store	silver standard	personnel administration
partnership	department store	tael	profit sharing
pawnbroking	fair	two-tier gold system	retraining program
public enterprise	general store	yen	right-to-work law
public relations	mail-order business	<i>production:</i>	strike
public utility	market research	conservation	trade union
trust company	marketing	cost	unemployment
zaibatsu	retailing	cost-benefit analysis	union shop
<i>economic measurement and forecasting:</i>	supermarket	marginal-cost pricing	wage theory
consumer price index	trade fair	mathematical programming	yellow-dog contract
cost of living	trading stamp	pollution	
Dow Jones average		price	
econometrics			

Biographies

<i>advertising and public relations:</i>	Markowitz, Harry M.	Rothschild family	Hughes, Howard
Benton, William	Mellon, Andrew W.	Sage, Russell	Hunt, H.L.
Bernays, Edward I.	Miller, Merton H.	<i>industry:</i>	Iacocca, Lee
Bernbach, William	Modigliani, Franco	Carnegie, Andrew	Krupp von Bohlen und Halbach, Alfred
Byoir, Carl	Morgan, John	du Pont family	Krupp von Bohlen und Halbach, Gustav
Lasker, Albert	Pierpont	Field, Marshall	McCormick, Cyrus
<i>finance:</i>		Ford, Henry	Hall
Baring family		Getty, J. Paul	
Belmont family		Guggenheim, Meyer and Daniel	
Fugger family		Hammer, Armand	

Pew, J. Howard; and Pew, Joseph N., Jr.	Thyssen family <i>labour:</i> Chavez, Cesar	Meany, George Reuther, Walter Stephens, Uriah Smith	Penney, J.C. Sears, R.W. Ward, Montgomery
Rockefeller, John D.	Debs, Eugene V.	Woodcock, George	See also Section
Schwab, Charles M.	Feather, Victor	<i>merchandising:</i>	10/36 of Part Ten
Squibb, E.R.	Hill, Joe	Marcus, Stanley	
Tata family	Hoffa, James R.		

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- A. The distribution of wealth and income by categories of the population
 1. The nature and measurement of wealth and income
 2. Methods of classifying the distribution of wealth and income
 - a. Distribution by factor shares: wages, profits, interest, and rent
 - b. Distribution according to the number of persons in various classes of wealth and income
 3. Patterns of wealth and income distribution among various countries and among persons within a country
 - a. Frequency distributions
 - b. Comparisons among wealth and income groups
- B. The routes by which government affects the distribution of wealth and income
 1. The national budget as the program of the government's revenues and expenditures
 2. The nature and purposes of taxation
 - a. Principles of taxation; *e.g.*, adequacy, adaptability, universality, ability to pay
 - b. The effect of taxes on the distribution of income: progressive and regressive taxes
 - c. The burden of taxation: the problem of shifting and incidence
 - d. Characteristics of national tax systems: comparisons of tax burdens
 3. Kinds of taxes
 - a. Taxes on real and personal property
 - b. Sales and excise taxes
 - c. Tariffs and export taxes
 - d. Taxes on personal income and capital gains
 - e. Taxes on corporate income and excess profits
 - f. Death and gift taxes
 - g. Social security and payroll taxes
 4. Transfers and subsidies
 - a. Interest payments on the public debt
[see B.5., below]
 - b. Subsidies and tax concessions
 - c. Government-sponsored and government-administered welfare programs
 5. The financing of budgetary deficits and surpluses
 6. Direct controls over the private sector
 - a. Price, wage, and profit control
 - b. Control of restrictive practices: antitrust legislation, regulations imposed upon public utilities, labour legislation imposed on unions
[see also 532.C.1.d.]
 - c. Economic mobilization for war
 7. Land reform: the redistribution of land tenure

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the distribution of income and wealth

Economic Theory	Social Sciences, The
Government Finance	Social Welfare
International Trade	Taxation
Land Reform and Tenure	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>government revenue and spending:</i>	inheritance tax	taxation	protectionism
ad valorem tax	likin	toll	rationing
aid	luxury tax	treasury bill	<i>wealth and income:</i>
assessment	poll tax	unemployment	absentee
capital-gains tax	progressive tax	insurance	ownership
capital levy	property tax	use tax	allodium
death tax	public debt	value-added tax	disposable income
depletion	regressive tax	war finance	ejido
allowance	relief	welfare state	enclosure
estate tax	revenue bond	workers' compensation	equal-field system
excess-profits tax	sales tax	<i>regulation of</i>	investment credit
gift tax	single tax	<i>economic activity:</i>	living, standard of
government budget	social insurance	antitrust law	métayage
guaranteed	social security	fair-trade law	profit
minimum income	social welfare	laissez-faire	wealth
income tax	program	land reform	and income,
indexation	subsidy	nationalization	distribution of
	tariff		

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INDEX: See entries under all of the terms above

Section 535. Macroeconomics**A. National income and employment theory**

1. The concern of income and employment theory with changes in *aggregate* output, employment, and prices
 - a. The classical law of markets contrasted with the Keynesian theory of effective demand
 - b. The classical and Keynesian theories of unemployment
2. The circular flow of income and expenditure: national product as goods and as earnings
3. Analyses of fluctuations in national income

B. International economic and financial equilibrium and disequilibrium

1. Foreign exchange markets: problems of alternative monetary standards and fixed and fluctuating exchange rates
 - a. Equilibrating movements in the balance of payments and the mechanisms of adjustment: arbitrage, short-term movements, interest rates, and forward exchange
 - b. Disequilibrating movements as a response to currency devaluation: covering, hedging, and speculation
 - c. Balance of payments accounting
 - d. Methods for adjusting to fundamental disequilibrium: fiscal and monetary policy, incomes policy, devaluation and revaluation, and restrictions on capital movements
2. International monetary and financial institutions: the International Monetary Fund, the Group of Ten, and other attempts at international cooperation
[see also 533.D.2.f.]

- a. Problems of maintaining adequate gold and currency reserves: gold crises, special drawing rights
- b. The aftermath of major wars: economic and financial crises, economic nationalism

C. Business cycles

1. The statistical study of cycles: the identification and measurement of business cycles, various cyclical theories
2. Theories of the business cycle and business cycle models
3. Countercyclical monetary and fiscal policy

D. Inflation and deflation

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with macroeconomics

Economic Theory
 Government Finance
 International Trade
 Social Sciences, The

MICROPAEDIA: Selected entries of reference information

General subjects

<i>economic cycles:</i>	monetarism	International	international
business cycle	monetary policy	Development	payment
depression	national income	Association	international trade
inflation	accounting	International	invisible trade
panic	nationalization	Finance	most-favoured-
Phillips curve	open-market	Corporation	nation treatment
recession	operation	International	payments,
<i>fiscal and monetary</i>	parity	Monetary Fund	balance of
<i>policy:</i>	regional	<i>trade:</i>	protectionism
bimetallism	development	comparative	quota
bullionism	program	advantage	reciprocity
deficit financing	silver standard	customs union	tariff
economic stabilizer	sterling area	embargo	trade, balance of
fiscal policy	two-tier gold	exchange rate	trade, terms of
fractional reserve	system	free trade	trade agreement
system	<i>international</i>	free-trade zone	visible trade
gold-exchange	<i>monetary and</i>	General	
standard	<i>financial institutions:</i>	Agreement on	
gold standard	International	Tariffs and Trade	
Gresham's law	Bank for	imperial preference	
incomes policy	Reconstruction	international	
interest	and Development	exchange	

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Section 536. Economic Growth and Planning

- A. The nature and causes of economic growth
 1. Various factors influencing economic growth; *e.g.*, technology, markets, the supply of capital, the labour force, governmental fiscal policies
 2. The theory of economic growth and models of growth
 - a. Various models of economic growth: supply-determined models, demand-determined models, and target-instrument models
 - b. The practical functions of growth theory and mathematical growth models
 3. Social costs and benefits of economic growth
 4. Economic growth in developing countries
 - a. The relationship between economic underdevelopment and low per capita income: the rate of increase of gross domestic product (GDP) as compared to population growth
 - b. Various theories of national economic development and economic retardation
 5. Changes in economic efficiency as measured by changes in output per unit of input: economic productivity
- B. Planning for economic growth and stability
 1. The nature of economic planning
 2. Economic planning in Communist countries
 3. Economic planning in developed non-Communist countries
 4. Economic planning in developing countries

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with economic growth and planning

Economic Growth and Planning
 Economic Theory
 Government Finance
 International Trade
 Social Sciences, The

MICROPAEDIA: Selected entries of reference information

General subjects

economic development	economic growth economic planning	Gosplan government budget	international trade productivity
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Division IV. Politics and Government

[For Part Five headnote see page 173.]

The outlines in the four sections of Division IV treat general theories of the state and of government; the structure, branches, and offices of government; the functioning of government; and international relations in peace and war.

Section 541. Political Theory 202

542. Political Institutions: the Structure, Branches, and Offices of Government 204

543. The Functioning of Government: the Dynamics of the Political Process 205

544. International Relations: Peace and War 206

Section 541. Political Theory**A. The national state as viewed in political theory**

1. Properties of statehood: sovereignty
2. The state and the individual
3. The national state in the international community
[see also 552.B.]
4. Various conceptions of the bases of legitimacy and authority of government
 - a. Continuing consent of the governed: popular sovereignty
 - b. The social contract
 - c. Venerable sanction: hereditary monarchy, constitutional succession
 - d. Divine right: God as the source of political authority
5. Theories of constitutionalism, modern constitutional governments
[see also 551.B.4.]
 - a. Origins and theories of constitutional government
 - b. Features of constitutional government
 - c. Methods of constitutional growth: evolution and substantive replacement

B. Patterns of political action as viewed in political theory

1. Political action within small groups, villages, or communities
2. Political action by organized parties
3. Political action by special-interest groups
4. The political influence of public opinion

C. Political concepts, ideologies, and problems

1. The concept of political power
2. The concept of human rights
3. Modern ideologies
 - a. The importance of ideology to a political system or movement: the relationship between ideological and civil politics
 - b. Current political ideologies and tendencies
 - i. Anarchism
 - ii. Communism
 - iii. Conservatism
 - iv. Fascism
 - v. Liberalism
 - vi. Marxism
 - vii. Nationalism
 - viii. Socialism

4. Contemporary political issues and problems

- a. The problem of church and state: its background and contemporary form
- b. The urban problem: the administration of cities and metropolitan areas
[see also 524.B. and 542.A.1.c.]
- c. The problem of international cooperation and integration
[see also 544.A.]
- d. The issue of centralization of power versus decentralization
- e. The problem of adapting traditional political forms to changing conditions
- f. Bureaucracy: the issue of responsive government
[see 542.C.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with political theory

Constitution and Constitutional Government	Political Parties and Interest Groups
Human Rights	Social Sciences, The
Ideology	Socio-Economic Doctrines
Marxism, Marx and	and Reform Movements, Modern

MICROPAEDIA: Selected entries of reference information

General subjects

<i>charters and documents:</i>	representation	individualism	<i>political</i>
Constitution of the United States of America	self-determination	jingoism	<i>organizations:</i>
Kapital, Das	social contract	Leninism	commonwealth
Magna Carta	sovereignty	liberalism	interest group
Rights, Bill of	<i>political ideologies:</i>	Maoism	political machine
Rights of Man and of the Citizen,	anarchism	Marxism	political party
Declaration of the Universal	authoritarianism	National Socialism	popular front
Declaration of Human Rights	Christian Socialism	nationalism	soviet
<i>concepts of sovereignty:</i>	collectivism	nihilism	<i>status of the individual:</i>
church and state	communism	pluralism	alien
divine right of kings	conservatism	radical	bourgeoisie
established church	corporatism	revisionism	citizenship
powers,	democracy	social democracy	freedman
separation of	dialectical	socialism	nationality
	materialism	Stalinism	naturalization
	Eurocommunism	Syndicalism	proletariat
	fascism	totalitarianism	refugee
	Fourierism	Trotskyism	
	Guild Socialism	utopia	
	Idéologie		
	ideology		

Biographies

Bakunin, Mikhail Aleksandrovich	Herzen, Aleksandr	Mao Zedong	Tocqueville, Alexis de
Bebel, August	Jefferson, Thomas	Marx, Karl	Trotsky, Leon
Bentley, Arthur F.	Kropotkin, Peter	Plekhanov, Georgy Valentinovich	Webb, Sidney and Beatrice
Bernstein, Eduard	Laski, Harold J.	Proudhon, Pierre-Joseph	See also Section 10/36 of Part Ten
Blanc, Louis	Lasswell, Harold D.	Rousseau, Jean-Jacques	
Brecht, Arnold	Lenin, Vladimir		
Burke, Edmund	Ilich		
Engels, Friedrich	Lippman, Walter		

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Section 542. Political Institutions: the Structure, Branches, and Offices of Government

A. Political systems

1. Levels and structures of various systems of government

a. Supranational political systems: empires; leagues, confederations, and commonwealths; regional federations; world congresses
[see 544.A.]

b. National political systems: the unitary nation-state system, the federal state system

c. Urban governments

d. Other subnational political systems: tribal community governments, rural community governments, regional community governments
[see also 521.A.]

2. Types and models of political systems

B. The branches of government

1. The concentration of legislative and executive functions: parliamentary rule

2. The legislature

3. The executive

4. The judiciary

[see also 552.F.1.]

C. Public administration: the planning, organization, and coordination of governmental bureaucratic operations; civil service

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with political institutions: the structure, branches and offices of government

Cities	Political Systems
Government, The Forms of:	Public Administration
Their Historical Development	Social Sciences, The

MICROPAEDIA: Selected entries of reference information

General subjects

<i>administrative units:</i>	dictatorship	<i>municipal</i>	<i>titles and offices:</i>
borough	federalism	<i>government:</i>	chancellor
canton	government	alderman	count
city	military	burgomaster	duke
city-state	government	city manager	emperor
commonwealth	monarchy	mayor	grand duke
commune	oligarchy	pao chia	king
county	two-party system	town meeting	landgrave
hsien	<i>legislative bodies:</i>	<i>public administration:</i>	lord
municipality	Commons,	administrative law	president
shire	House of	bureaucracy	prime minister
township	Congress of the	cabinet	prince
<i>courts and judiciary:</i>	United States	civil service	tsar
See Section 552	Diet	commission	<i>other:</i>
<i>governmental forms</i>	Knesset	ombudsman	assembly
<i>and systems:</i>	Lords, House of	public	local option
absolutism	Parliament	administration	states' rights
aristocracy	Representatives,	regulatory agency	tenure
bicameral system	House of	spoils system	
democracy	Senate		

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Section 543. The Functioning of Government: the Dynamics of the Political Process

- A. The ways in which political power is exercised
1. Internal and external security functions of government
 2. The conduct of foreign relations: the function of government in relation to other sovereign states, its own dependencies, and international organizations
[see 544]
 3. Supervisory functions of government: the resolution of conflicts through mediation and the adjudication of suits
[see also 552.F.1. and 3.]
 4. Regulatory functions of government: the establishment and active enforcement of standards
 5. Law enforcement and the corrective functions of government: sanctions, inducements, and penalties
[see also 522.C.6. and D.2.i.]
 6. Enterprising functions of government
[see 355.D., 424.D., 522.D., 533.G.4., 534.B.4.c. and 6.b., 561. 724.A.2.a., and 732.I.]
- B. Government's role in production and consumption
- C. Methods of changing the form of government
1. Peaceful changes: by electoral process (plebiscite), by constitutional mandate
 2. Violent changes: revolution, civil war, conquest by a foreign power

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the functioning of government: the dynamics of the political process

Censorship	Political Parties and Interest Groups
Crime and Punishment	Political Systems
Police	Social Sciences, The

MICROPAEDIA: Selected entries of reference information

General subjects

<i>censorship:</i>	<i>electoral process:</i>	<i>law enforcement:</i>	sheriff
banning	absentee voting	capital punishment	torture
ensor	Australian ballot	constable	<i>legislative procedure:</i>
censorship	election	criminal	cloture
obscenity	electoral college	investigation	filibuster
pornography	plebiscite	Federal Bureau of	legislative
<i>electoral</i>	plurality system	Investigation	investigative
<i>constituencies:</i>	political	Interpol	powers
gerrymandering	convention	KGB	parliamentary
legislative	political party	police	procedure
apportionment	primary election	posse comitatus	<i>other:</i>
pocket borough	referendum and	punishment	revolution
proportional	initiative	ranger	sabotage
representation	suffrage	Royal Canadian	terrorism
		Mounted Police	

Biographies

See Section 541

INDEX: See entries under all of the terms above

Section 544. International Relations: Peace and War

- A. The politics of international relations
 1. Transnational political parties and movements, *e.g.*, Pan-Africanism, Pan-Arabism, Pan-Slavism, European federalism
 2. International and nonnational organizations and agencies, *e.g.*, the United Nations, Red Cross and Red Crescent
- B. International treaties and agreements
 1. Nonaggression treaties: collective security
 2. Treaties terminating wars
 3. Arms limitation and disarmament treaties
 4. Territorial treaties regarding the sale or transfer of land; treaties granting rights of access and other uses of territory; treaties settling border disputes
 5. Economic and commercial treaties
[see 533.F.3.]
 6. Communications and transportation treaties
 7. Cultural exchange treaties
- C. Foreign policy and diplomacy
 1. Foreign policy: its aims and compatibility with national and humanitarian interests
 2. The use of diplomacy in the negotiation of international disputes; public international conferences, arbitration, and mediation; secret diplomacy
 3. Foreign aid; government-sponsored organizations that affect internal relations in nonpolitical spheres, *e.g.*, economic, cultural, technological organizations
- D. The use of intelligence and counterintelligence activities in the preservation of national security and the conduct of international affairs
- E. War among states
 1. Degrees and kinds of war: limited war; total war; ethnic or tribal wars; religious wars; national, regional, and worldwide wars; civil wars and insurrections; guerrilla warfare
 2. The conduct of war
 - a. Military strategy
 - b. Military tactics
 - c. Military logistics
 - d. Effects of psychological warfare on troops and civilians during wartime
 - e. International law relating to the treatment of persons during wartime
[see also 552.B.4.]
 - f. The management of military expenditures
 3. Armed forces: military organizations designed for conquest or defense
 - a. Types of soldiers: *e.g.*, professional, volunteer, conscripted, and mercenary
 - b. Historical development of organized military forces
 - c. Establishment and maintenance of various branches of the armed forces
 - i. Ground forces
 - ii. Naval and amphibious forces
 - iii. Air forces
 - iv. Various auxiliary branches: *e.g.*, police, intelligence, logistics, communications, medical, and legal corps
 4. The consequences of war

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with international relations: peace and war

Diplomacy	United Nations
Intelligence and Counterintelligence	War, The Theory and Conduct of
Social Sciences, The	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>aggression and warfare:</i>	executive agreement	air force	streltsy
aggression	foreign service	army	<i>military science:</i>
air warfare	Geneva	battalion	deterrence
amphibious warfare	Convention	brevet	just war
annexation	geopolitics	captain	logistics
belligerency	international agreement	cavalry	sea power
blitzkrieg	international organization	centurion	strategy
blockade	legate	chasseur	tactics
civil defense	mediation	coast guard	<i>sovereignty:</i>
conquest	neutralism	commandant	colonialism
convoy	power, balance of	company	dominion
economic warfare	treaty	division	exterritoriality
embargo	United Nations	dragoon	home rule
mobilization	<i>intelligence gathering:</i>	frogman	imperialism
sabotage	BND	general	influence,
safe-conduct	Central Intelligence Agency	general staff	sphere of
terrorism	counterespionage	grenadier	protectorate
total war	espionage	guerrilla	sovereignty
trench warfare	intelligence	hussar	territorial waters
visit and search war	KGB	infantry	<i>other:</i>
<i>diplomacy and international agreements:</i>	MI-5	legion	American Legion
alliance	MI-6	lieutenant	concentration
ambassador	Mossad	marine	camp
armistice	National Security Agency	marshal	conscientious
arms control	Stasi	mercenary	objector
collective security	Ultra	military police	conscription
consul	<i>military organization and personnel:</i>	militia	defense economics
diplomacy	admiral	navy	fifth column
		phalanx	impressment
		platoon	martial law
		privateer	military, naval,
		ranger	and air academies
		regiment	

Biographies

<i>diplomats and statesmen:</i>	Dulles, John	Khrushchev,	Stevenson,
Adenauer, Konrad	Foster	Nikita S.	Adlai E.
Ben-Gurion, David	Eisenhower,	Kissinger,	Sun Yat-sen
Bismarck,	Dwight D.	Henry A.	Thant, U
Otto von	Gandhi, Mohandas	Lie, Trygve	Weizmann, Chaim
Bunche, Ralph	Karamchand	Marshall,	Wilson, Woodrow
Chamberlain,	Gaulle, Charles de	George C.	<i>intelligence agents</i>
Neville	Gladstone,	Metternich,	<i>and officers:</i>
Chou En-lai	William Ewart	Klemens,	Baker, Lafayette
Churchill, Winston	Goebbels, Joseph	Fürst von	Curry
Clemenceau,	Gromyko, Andrey	Mussolini, Benito	Bancroft, Edward
Georges	Andreyevich	Nasser, Gamal	Boyd, Belle
Curzon, George	Hammar skjöld,	Abdel	Burgess, Guy; and
Nathaniel	Dag	Nehru, Jawaharlal	Maclean, Donald
Curzon,	Hitler, Adolf	Roosevelt,	Donovan,
Marquess	Ho Chi Minh	Franklin D.	William J.
Disraeli, Benjamin	Kennedy, John F.	Stalin, Joseph	Hiss, Alger
			Mata Hari

Redl, Alfred	<i>military theorists:</i>	Mahan, Alfred	Scharnhorst,
Schulmeister, Karl	Clausewitz,	Thayer	Gerhard Johann
Van Deman,	Carl von	Montalembert,	David von
Ralph H.	Douhet, Giulio	Marc-René,	Sun Tzu
Winterbotham,	Jomini, Henri,	Marquis de	Vauban, Sébastien
Frederick William	baron de	Montecuccoli,	Le Prestre de
Yardley, Herbert	Liddell Hart, Sir	Raimondo	
Osborne	Basil		

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Division V. Law

[For Part Five headnote see page 173.]

The outlines in the three sections of Division V treat philosophies and systems of law, and the practice of law; the branches of public law; and the branches of private law.

Section 551. Philosophies and Systems of Law; the Practice of Law 208

552. Branches of Public Law, Substantive and Procedural 210

553. Branches of Private Law, Substantive and Procedural 212

Section 551. Philosophies and Systems of Law; the Practice of Law

A. Western and non-Western philosophies of law

1. Western philosophy of law

- a. The scope of the Western philosophy of law and its relationship to other branches of philosophy
- b. Problems of the philosophy of law, various approaches to a theory of law or jurisprudence
- c. The relationship between law and morality: the influence of the principles of natural law
- d. Historical survey of legal theories from the ancient world to the 20th century

2. Non-Western philosophies of law: Islāmic, Chinese, and other non-Western philosophies of law

B. Ancient and modern legal systems

1. Primitive law: the legal systems of nonliterate peoples

2. Ancient systems of law

- a. Egyptian law
- b. Cuneiform law
- c. Chinese law
- d. Greek law
- e. Hellenistic law
- f. Roman law
- g. Germanic law

3. Medieval European law

- a. Origins and development of medieval European law
- b. Sources and institutions of medieval constitutional law
- c. Institutions of private law in medieval Europe
- d. Development of canon law

4. Modern systems of law

- a. Anglo-American common law
- b. Continental civil law
- c. Soviet and socialist law

- C. The study of the distinctions and parallels among diverse legal systems
- D. The profession and practice of law
1. The profession of law
 2. Legal ethics
 3. Educational requirements for the legal profession

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the philosophies and systems of law; the practice of law

Law, The Profession and Practice of
Legal Systems, The Evolution of Modern Western

MICROPAEDIA: Selected entries of reference information

General subjects

<i>ancient legal codes, principles and institutions:</i>	ecclesiastical court	Chambre des Enquêtes	sergeanty
aedile	excommunication	Chambre des Requêtes	socage
archon	False Decretals	Clarendon, Assize of	tallage
Basilica	Gratian's Decretum	court baron	usury
ensor	Hadīth	court leet	wardship and marriage
civitas	Halakha	curia	wergild
clientship	Mishna	fehmic court	<i>modern legal codes and systems:</i>
comitia	penitential book	High Commission, Court of	adat
concubinage	Shari'ah	High Court of Admiralty	Chinese law
cuneiform law	Talmud	law merchant	German Civil Code
decemviri	Torah	legal glossator	Indian law
delator	<i>legal practitioners:</i>	manorial court	Israeli law
delict	advocate	Parlement	Japanese Civil Code
dharmashastra	assessor	piepoudre court	Japanese law
dicastery	attorney general	prerogative court	Napoleonic Code
Egyptian law	barrister	Privy Council	Prussian Civil Code
emphyteusis and superfices	lawyer	Reichskammergericht	Roman-Dutch law
Greek law	notary	Requests, Court of	Scottish law
Hammurabi, Code of	solicitor	Star Chamber, Court of	Soviet law
hypothec	<i>medieval European law—codes and systems:</i>	<i>medieval European law—principles:</i>	Swiss Civil Code
interdict	Anglo-Saxon law	blood money	<i>other:</i>
jus gentium	Brehon law	clergy, benefit of	assize
jus Latii	capitulary	composition	bar association
Justinian, Code of	Germanic law	compurgation	civil law
manus	Jerusalem, Assizes of	copyhold	common law
nomos	Sachsenspiegel	demesne	custom
Pandects	Salic Law	entail	disbarment
patria potestas	Salic Law of Succession	feudal land tenure	duel
proscription	Scandinavian law	feudalism	equity
Roman law	Welsh law	fief	feud
talion	Westminster, Statutes of	frankpledge	law
Twelve Tables, Law of the	<i>medieval European law—institutions and officers:</i>	freehold	law code
<i>ecclesiastical law:</i>	audiencia	heriot	movable and immovable
canon law	Augmentations, Court of	homage and fealty	natural law
Codex Juris Canonici	Chambre des Comptes	liege	sumptuary law
Corpus Juris Canonici		peine forte et dure	
decretal		right, petition of	
dispensation		seisin	

Biographies

Austin, John	Cockburn, Sir	Hand, Learned	Pufendorf, Samuel,
Blackstone, Sir	Alexander James	Harlan, John	Freiherr von
William	Edmund	Marshall	Savigny, Friedrich
Brandeis, Louis	Coke, Sir Edward	Holmes, Oliver	Karl von
Brennan, William	Darrow, Clarence	Wendell, Jr.	Solon
J., Jr.	Draco	Jackson, Robert H.	Stone, Harlan
Brougham and	Erskine, Thomas	Johnson, William	Fiske
Vaux, Henry	Erskine, 1st	Mansfield, William	Story, Joseph
Peter Brougham,	Baron	Murray, 1st	Taney, Roger
1st Baron	Field, Stephen	Earl of	Brooke
Burger, Warren E.	J(ohnson)	Marshall, John	Waite, Morrison
Cardozo, Benjamin	Fortas, Abe	Matthews, Stanley	Remick
Nathan	Frankfurter, Felix	Miller, Samuel	Warren, Earl
	Grotius, Hugo	Freeman	White, Edward
	Hale, Sir Matthew		Douglass

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Section 552. Branches of Public Law, Substantive and Procedural

- A. Laws defining and implementing the authority and power of the state
 - 1. Basic laws governing the organization and functions of the state: constitutional law
 - 2. Laws governing public administration: regulation of the organization, powers, duties, and functions of public administrative authorities
- B. Laws governing relations among sovereign states
 - 1. Sources and concepts of international law
 - 2. The attempt to create a supranational legislative and executive authority: the United Nations
 - 3. The attempt to create a supranational judicial authority
 - 4. The attempt to impose rules of warfare
 - 5. The attempt to limit and punish war crimes and crimes against peace and humanity
 - 6. The attempt to preserve the peaceful uses and exploration of outer space
- C. Laws governing acts viewed as crimes
 - 1. Principles and doctrines of criminal law: comparisons between common law and civil law systems
[see also 543.A.5.]
 - 2. Laws governing offenses committed by military forces and other persons subject to military discipline
- D. Laws promoting the public welfare
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 - b. Civil procedure
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Nürnberg trials
piracy
prisoner of war
prize court
safe-conduct

sequestration
space law
territorial waters
Universal
Copyright
Convention

war, law of
war crime
other:
administrative law

legislative
investigative
powers
military law
United Nations

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2. Methods of acquiring property rights
3. Types of property rights classified by types of ownership
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 - c. Air law
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 - a. National or territorial jurisdiction and venue of courts: the competence of a court to handle a case

- b. Jurisdiction or venue in private international law: the source and nature of the conflict of laws, foreign judgments and choice of law
 - c. Definitions and limitations of parties to a suit: class actions and *amicus curiae*
 - d. Provisional remedies sought prior to trial; *e.g.*, writs of attachment, injunctions, and other restraining orders
 - e. The commencement of civil action: summons, pleadings, appearance, pretrial motions, discovery procedures, and pretrial conference
2. The conduct of civil trials: the law of evidence
 3. The rendering of judgment in civil cases: assessment of damages, *res judicata*, collateral estoppel
 4. Post-trial appeals and other methods of review

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with branches of private law, substantive and procedural

Business Law	Property Law
Family Law	Torts
Inheritance and Succession	Transportation Law
Procedural Law	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>business law:</i>	attorney,	concubinage	preemption
affreightment	power of	consensual union	prescription
agency	damages	divorce	property
air law	declaratory	guardian	real and personal
antitrust law	judgment	illegitimacy	property
average	escrow	marriage law	remainder
bankruptcy	foreclosure	minor	restrictive covenant
business law	garnishment	morganatic	reversion
caveat emptor	injunction	marriage	riparian right
cessio bonorum	joinder and	separation	servitude
composition	impleader	<i>property law:</i>	treasure trove
consideration	liability	abandonment	trust
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copyright	mandamus, writ of	ancient lights	usufruct
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hypothecc	<i>estate law:</i>	deforcement	negligence
insolvency	executor	domain	conversion
labour law	gift	easement	damages
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liquidation	inheritance	eminent domain	delict
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trademark	alimony	mortgage	tort
<i>civil procedure:</i>	annulment	mortmain	trespass
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b. Elementary and secondary education

c. Higher education: colleges, universities, and professional schools

d. Special education: education of exceptional children

e. Education of the adult population

f. Vocational training: apprenticeship and employee training

2. The preparation and performance of teachers

a. The education of teachers

b. The teaching profession

3. The economics of education

4. Social aspects of education

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the aims and organization of education

Philosophies of the Branches of Knowledge

Teaching

MICROPAEDIA: Selected entries of reference information

General subjects

adult education:

adult education

chautauqua

movement

folk high school

lyceum movement

elementary and

secondary education:

comprehensive

school

elementary

education

eleven-plus

graded school

grammar school

Grundschule

Gymnasium

Hauptschule

high school

lycée	madrasah	computer-assisted	retraining program
preparatory school	military, naval, and	instruction	vocational
public school	air academies	correspondence	education
realschule	nation	education	<i>other:</i>
secondary	normal school	Dalton Plan	academic freedom
education	Rhodes scholarship	Initial Teaching	educational
technical education	university	Alphabet	psychology
Vorschule	university extension	monitorial system	physical education
<i>higher education:</i>	<i>preschool education:</i>	programmed	special education
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degree	day nursery	progressive	summer camp
fraternity and	kindergarten	education	
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Fulbright	preschool education	teaching	
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2. Education in the Persian, Byzantine, early Russian, and Islāmic civilizations
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 - b. Byzantine education: influences of Greek Christian and humanistic culture; development of primary, secondary, and higher educational institutions
 - c. Kiev and Muscovy: Russian education to the period of the early Romanovs
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- a. Christian education to the 8th century: early schools; development of monastic schools in England, Ireland, Italy, and Spain
- b. The cultural revival under Charlemagne and his successors
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 - a. Indian education from c. 700 to 1707
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 - c. Japanese education from ancient times to 1867
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 - b. The humanistic tradition in Italy
 - c. The humanistic tradition in northern and western Europe
 - d. Education during the Reformation and Counter-Reformation
6. European education in the 17th and 18th centuries
 - a. The social and historical setting
 - b. Educational theories and practices
 - c. European influences in New World educational development
7. Western education in the 19th century
 - a. The social and historical setting: nationalism, industrialism, urbanization, political revolution and reform
 - b. The early reform movements: the new pedagogy and psychology
 - c. Development of national systems of education
 - d. Spread of Western educational practices to Asian countries
8. Education in the 20th century
 - a. Political, social, economic, and intellectual trends
 - b. Traditional and experimental educational movements in the West
 - c. The modernization of education in Asia and Africa
 - d. Education in colonies and newly emerging nations in Africa, Asia, and Latin America

C. International educational activities

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with education around the world

Education, History of
Teaching

MICROPAEDIA: Selected entries of reference information

General subjects

<i>educational systems:</i>	<i>history of education:</i>	<i>juku</i>	<i>other:</i>
coeducation	American	land-grant college	United Nations
correspondence	Missionary	lyceum movement	Educational,
education	Association	mechanics'	Scientific and
educational system	cathedral school	institute	Cultural
liberal arts	charity school	normal school	Organization
minority education	chautauqua	Quincy Plan	
monitorial system	movement		
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progressive	hornbook		
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Introduction to Part Six:

The World of Art

by Mark Van Doren

Let us imagine if we can a world entirely without art: without story, image, edifice, or significant sound. If we can, for perhaps it is impossible. Such a world might well be invisible, inaudible, ineffable, and intangible. Even if we could see it, hear it, feel it, we would not know we did, at least as men know things. Without the earliest of all arts, language, we would scarcely know of what we were deprived: the privilege, namely, of expressing our satisfaction or dissatisfaction with what had taken place before our eyes. Without the arts of speaking, listening, thinking, counting, and measuring—without the intellectual arts—we could not assess or repossess the experience we had undergone. Without the useful arts we could make nothing, build nothing worthy to contain and shelter our bodies, to be a home wherein our thought might rest. And then without the fine arts—the arts that serve only themselves, that are ends, not means, that justify themselves when they give us nothing but pleasure—we would be shallow and poor of mind, with little or no sense of the world's depth and colour, or of ourselves as creatures for whom the present moment is also past and future. We call these arts fine not because they are better than the others but because they are different, as beauty is different from use—beauty that is its own excuse for being.

None of them is more intimately ours than story. The art of literature is the art of story; there are songs and there are essays long and short, there are histories, there are biographies, there are treatises, sermons, and discussions of everything under the sun, but story is our first and last entertainment—when we are children and when we are too old to care any more what truth is unless it comes in the past tense, with persons reflecting in their lives the peculiar radiance that attends the accidents of time and character. Stories may vary in length from the anecdote to the epic, from the fairy tale to the novel, the imaginary biography, the romance. And they may reach us in many forms: in the theatre, for instance, where they may employ flesh-and-blood actors to convey their meaning or where they may be only flickers of light and shade upon a screen that has no depth save what we give it in our imaginations; where, in other words, they call themselves plays or motion pictures or where, if music also sounds and dancers whirl and pose, they call themselves ballets.

Nature does not tell stories; only artists do, and in the process they work transformations that measure the distance between matter and mind. In nature, so far as we can know it, there are no beginnings and no ends in the sense familiar to both writers and readers of fiction and drama, or for that matter history, which likewise imposes form upon a welter of events. No matter how simple a tale is, or how complex, how few the words in it or how many, it is a human construction that no animal or plant, and of course no stone, would find in the least degree interesting;

whereas human beings hold their breaths until an end is reached. Ends are intelligible as the raw materials of life seem not to be; if life itself does not become intelligible through story, it becomes in some mysterious way both beautiful and clear, and for the time being that suffices.

Each of the fine arts flourishes both in large and in little forms. Just as story has a choice between the brevity of folk tales and the elaboration of epics and romances, so statements about life may be as compendious as a proverb—the wisdom of many and the wit of one—or as bulky as the longest book in numberless volumes. So music—the sound of other worlds—reaches our ears either as simple song or as opera and symphony and other complex forms. There are those who say that the song, like the anonymous fable or tale, is more lasting and important than compositions of great complexity can ever be; and they also say that the lyric poem, at least when it is perfect, as in truth it seldom is, has more to tell us, or at least deeper ways of touching us, than the most tremendous tragedy in five acts or the subtlest comic novel in a thousand pages. When a memorable melody attaches itself to a lyric or a ballad, something indeed does come into existence and hang there as if for perpetuity. Music is the most ineffable of all the arts. It has its own language and it listens to itself; we do not so much hear it as overhear it, nor can we speak very sensibly about what we have overheard. Successful music, powerful music, has an effect upon us that many have tried in vain to describe; it takes us out of ourselves, they say, and perhaps they need to say no more than that. Even then they may be speaking only of the music that is native to them; Eastern music sounds like mere noise to untrained Western ears, and Western music has a monotony, say the Chinese, that Europeans of course deny is there. The same thing is true, though in lesser measure, of all the arts. East and West have different eyes as well as ears, and different thoughts.

The arts of drawing and painting, of etching and lithography, of engraving and decorative design, have covered many surfaces—canvas, plaster, parchment, paper—which no longer show where the artist's hand once worked; for the materials of these arts are perishable, as the marble of sculptors has been, as the bronze, as the wood. Much remains, but more does not. Even the cave paintings of prehistoric France and Africa, hailed by modern man when he discovered them as miracles of survival, may not survive the visits that living people rushed to pay them. Ancient Greek music has failed to survive for a further reason: we do not know how it was written or how it sounded; we are told that it had almost magical powers over those who heard it in its time, but that time is gone, along with the time when paintings adorned the walls and columns of Greek temples and houses. Painting has been for centuries the queen of the arts in Europe. Belgium,

The Netherlands, France, Germany, Spain, Italy, and England—each of them in its turn, and sometimes in more than one turn, has enriched the world with shapes and colours that only genius could have foretold, only passion could have brought into being. And that is but half the story; in China long before, in India, in Persia, in Japan, in Russia, the brushes of painters, sometimes tipped with gold, beautified and glorified the palaces of emperors, the tombs of princes, and the dwelling places of great gods. In Egypt for millennia the order of the world was registered in stone and gold, and the written word itself was pictures.

Sculpture, that once was solid and now is full of spaces—or may be—left open by the ingenuity of workers in metal, has changed as architecture has changed. Both arts now cultivate openness: buildings are closed, but the exterior is glass, so that space plays games with itself inside, and the effect is of a lightness that winds might blow away, except of course that the buildings look lean and strong enough to remain just where they are. It has always been true that architects desired the effect of lightness, as all art does, heaviness being a quality that no mind admires; any building weighs tons, but we are not supposed to think of that; rather indeed we are expected to imagine that brick and stone for once have learned to lie lightly on the earth, which they do not seem to press at all. So with Classical sculpture, from Greek days on; the charm of it was its poise, its grace, its management of idea in marble. So too with Classical architecture; the Parthenon is both massive and weightless, like a ship that might sail yet does not. And always in China and Japan there have been those curled and tapered roofs that still look as if at this very instant in time they are taking wing. The open revolution, then, was only a restatement of what had long been understood though some of its secrets were forgotten.

Abstraction in all the arts, for there is no art from which it is absent, is again a restatement of what has always been true, however feebly it was recognized by schools of artists who had lost contact with reality. Great painting, great music, great poetry, great architecture—great landscape architecture too—have never been strangers to abstraction, just as they have never been slaves to an incomplete understanding of what is meant when we say that art is imitation. It *is* imitation, but of what? Of essences, not accidents; of the truth that is hard to see; of beauty that is basic; of shapes that will not change; of colours that will not fade. And if, say, the great painters of the past, comprehending this, still “copied nature,” they did not do so inanely. They did so, on the contrary, with huge effort aimed at the verities that underlie verisimilitude, so that in one sense they were not copying at all; they were extracting essences, they were reducing appearances to the ideas that informed them; they were, in a word, abstracting truth from vessels that contained it. But they did not say they were doing this. They said they were copying nature. And when later on they were taken at their word by painters with inadequate aspiration, the result was woeful insipidity, was mediocrity and flatness. The heroic remedy was warfare against representation as such, was a shortcut to abstraction that could have its weakness too, was a loss, in all but the great revolutionaries, of the contact with Earth

which no art ever can be without. Abstract painting at its best—and the worst does not matter—imitates nature at nature’s best; is “like” nature after all, for nature is brilliant and strong, and abstract painting convinces us of this even though it dispenses with the particulars with which we used to be fascinated and of which we were quite properly fond.

A world entirely without art would be worse than invisible, inaudible, ineffable, and intangible. It would be a world without temporal dimension, it would be a world that human minds could not remember. Human memory is unique in its capacity not only to recall but also to utilize the past, and to apply it; and better still, to re-create it so that it becomes a part of the present moment, which is more like eternity than anything else we shall ever experience. Human memory is nothing less than the origin of human art.

“The Greeks fabled not unwisely,” said Sir Thomas Browne, “in making Memory the mother of the Muses.” The memory of man is indeed a wonderful thing, and his richest possession. Not only is it the source of all our arts, it is their record too, stored in the mind of the beholder, the listener. Plato even asked us to conceive “in the mind of man a block of wax, the gift of Memory, and when we wish to remember anything which we have seen, or heard, or thought in our own minds, we hold the wax to the perceptions and thoughts, and in that material receive the impression of them as from the seal of a ring; and we remember and know what is imprinted as long as the image lasts.” An artist whose poems or pictures or musical ideas have great power is certainly, we feel, the possessor of a memory that is always at his command, bringing to him at any moment whatever detail he needs, and reminding him too of the knowledge he has, and never forgets, of the way the world is put together, so that he does not misrepresent things as they are. The human race itself can be said to be such an artist, for it has its myths which it keeps alive, its stories that are “so true,” someone has said, “that they couldn’t have happened.” There is such a thing as folk memory, the mother perhaps of all our thoughts and feelings, and the guardian of such wisdom as we have.

A story that cannot be remembered, a song that fades out of the mind, a hero whose name escapes us, a sentence we thought we would never forget but somehow do—such works of art must be defective at the core. But there are others that we could not forget if we tried, and it is those we live with in the company of friends who remember them too. Perhaps the final justification of art is the two-fold pleasure it gives: the pleasure of remembering great and beautiful things that we cannot lose, and the pleasure of sharing them with others who possess them in the same fashion.

There is a limited number of such things, of these greatest of human works of art; by definition there can be no superfluous masterpieces. The ones we have are numerous after all, and no single person can claim to have done justice to every one of them, or can claim to know what further ones are still unborn, Mnemosyne, goddess of Memory and Mother of the Muses, will have the deciding vote as to which ones, now or in the future, will survive the ravages of time.

Part Six. Art

The outlines in the twelve sections of Part Six are concerned with mankind's creation, experience, and evaluation of works made primarily for aesthetic enjoyment and contemplation. The arts of making things primarily for practical use are treated in Part Seven, on technology.

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II. The Particular Arts 225

Division I. Art in General

The outlines in the three sections of Division I treat the theory and classification of the arts; the experience and criticism of works of art; and the nonaesthetic contexts of art.

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612. Experience and Criticism of Works of Art; the Nonaesthetic Contexts of Art 222

613. Characteristics of the Arts in Particular Cultures 224

Section 611. Theory and Classification of the Arts

A. The philosophy of art

1. Diverse conceptions of the scope of art
2. Diverse theories concerning the nature, functions, and effects of art: mimetic theories, expressive theories, formalist theories, pragmatic theories
3. The making of works of art: the creative process

B. Classification of the arts

1. Major distinctions among the kinds of art
 - a. By reference to the intention of the maker or the recipient of the work of art: useful art, fine art, arts that are both useful and fine
 - b. By reference to the manipulation of physical matter: the production of artistic works that are physical objects
 - c. By reference to performers as interpreters or creators of works of art
 - d. By reference to the use of notational devices; *e.g.*, literature, music, dance
2. Other distinctions among the kinds of art; *e.g.*, space and time arts, primary and auxiliary arts
3. The characterization of works of art by reference to the cultural or social circumstances of their production or the extent and character of their audience: the primitive, folk, and popular arts
4. Style in the arts
 - a. The nature of style
 - b. The varieties of style; *e.g.*, personal, school, ethnic, regional, and period styles
 - c. The dynamics of style: the historical development, diffusion, change, and duration of style in the arts

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major article dealing with the theory and classification of the arts

Philosophies of the Branches of Knowledge

MICROPAEDIA: Selected entries of reference information

art	mimesis
fine art	popular art
folk art	

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 2. The interpretation of works of art
 - a. Meaning in art
 - b. Symbol and myth in the arts
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 3. The appreciation of works of art
 4. Special problems of appreciation and apprehension
 - a. In the sphere of literature
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 - b. In the sphere of the theatrical arts
[see 622, 623, and 625]
 - c. In the sphere of music
[see 624]
 - d. In the sphere of the visual arts
[see 626, 627, 628, and 629]
- B. The criticism of works of art
 1. Diverse criteria of evaluation: aesthetic criteria; criteria related to the union of form and content; criteria related to meaning; criteria related to social, moral, or religious significance; criteria related to technique; criteria related to the intention of the artist
 2. The practice of criticism
 - a. The functions of the critic in relation to the artist, to his work, and to its public reception
 - b. Critical methods: analytical, interpretative, and descriptive types of criticism
 - c. Critical styles: journalistic criticism, scholarly criticism, annotative and referential criticism
 - d. Critical approaches to the arts
 - e. Factors affecting the excellence of criticism
- C. Scholarship in the arts
 1. Resources and methods of scholarship in the field of the arts
 2. The relation of scholarship in the arts to other humanistic disciplines; *e.g.*, to linguistic studies, to history, to archaeology
- D. The interaction of the arts with social, economic, and cultural institutions
 1. Social uses of art
[see 521.D.5.]

2. Social control of art: censorship and related forms of regulation
 3. The arts and religion
[see 811.G.1.]
 4. Technology, science, and the arts
[see 711.B.4.]
 5. The arts in education: aesthetic education
- E. The economics of art
1. Factors affecting the economic value of a work of art
 2. Systems of financing artistic activities
 3. The art market
 4. Remuneration of artists and protection of their rights
 5. Fraudulence in the arts: forgery, piracy, plagiarism
- F. The training and work of the artist
1. The preparation of the artist: methods of training
 2. Art as a vocation: conditions of work in the arts
 3. Professionalism and amateurism in the arts
- G. The preservation and dissemination of works of art
1. The role of institutions: libraries and archives; museums and galleries; producing associations—the preservation of works of art by performance
 2. The role of writing and notation
 3. The role of industry and commerce
 4. The role of mechanical and electronic media
 5. The role of oral tradition
 6. The role of imitative tradition
 7. The role of fairs, festivals, exhibitions, expositions, and related phenomena

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the experience and criticism of works of art; the nonaesthetic contexts of art

Arts, Practice and Profession of the
Libraries
Museums

MICROPAEDIA: Selected entries of reference information

General subjects

Actors Studio, The	forgery	Stanislavsky	WPA Federal Art Project
antique	library	method	
Armory Show	little magazine	Treasury Relief Art	
art collection	maniera	Project	
art conservation	Mbari Mbayo Club	Treasury Section	
art criticism	museum	of Painting and	
art history	PEN, International	Sculpture	
Beaux-Arts,	pinacotheca	Universal	
École des	Royal Academy of	Copyright	
Berne Convention	Dramatic Art	Convention	
censorship	Salon	World Intellectual	
copyright	Salon des	Property	
Degenerate Art	Indépendants	Organization	

Biographies

Baumgarten,
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Fenollosa,
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INDEX: See entries under all of the terms above

Section 613. Characteristics of the Arts in Particular Cultures

A. Arts of the Stone Age peoples

B. Arts of the Western tradition

1. In antiquity: the arts of ancient Egypt and the ancient Middle East, ancient Greek and Hellenistic arts, ancient Roman and Early Christian arts
2. Arts of the Middle Ages
3. Arts from the Renaissance to the present in Europe and America

C. Arts of Asian peoples

1. In East Asia: China, Japan, Korea
2. In Central Asia: Turkey, Afghanistan, Turkistan, Mongolia, and Siberia; Tibet and other Himalayan countries; the arts of the nomadic peoples
3. In South Asia: India, Sri Lanka, Kashmir, Pakistan, Bangladesh
4. In Southeast Asia: Burma, Cambodia, Indonesia, Malaysia, Thailand, Vietnam, the Philippines

D. Arts of the Middle East and of the Islāmic peoples

1. Arts of the Jewish peoples
2. Arts of North Africa and of the Arab world

E. Arts of the African peoples

1. Arts of Sudanic cultures
2. Arts of Central African cultures
3. Arts of East African cultures
4. Arts of Southern African cultures
5. Arts of West African cultures

F. Arts of the Oceanian peoples

1. Arts of Melanesia
2. Arts of Micronesia
3. Arts of Polynesia
4. Arts of the Australian Aboriginal peoples

G. Arts of the American Indian peoples

1. Arts of the Eskimo and North American Indian peoples
2. Arts of Meso-American peoples
3. Arts of South American peoples

H. Primitive, folk, and popular arts

[see also 611.B.3.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the characteristics of the arts in particular cultures; historical development of the arts

African Arts	Egyptian Arts	Middle Eastern	Prehistoric Peoples
American Peoples,	and Architecture,	Arts and	and Cultures
Arts of Native	Ancient	Architecture,	South Asian Arts
Central Asian	Folk Arts	Ancient	Southeast
Arts	Islāmic Arts	Oceanic Arts	Asian Arts
East Asian Arts			

MICROPAEDIA: Selected entries of reference information

<i>arts in particular</i>	Anglo-Saxon art	Expressionism	Novembergruppe
<i>cultures:</i>	Art Deco	formalism	Op art
African arts	Art Nouveau	Futurism	Ottonian art
Central Asian arts	Baroque period	Georgian style	Pop art
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East Asian arts	Bohemian school	Henry IV style	realism
Egyptian art	Byzantine art	Impressionism	Régence style
Islāmic arts	Carolingian art	Jacobean age	Regency style
Korean art	Classicism and	Louis XIII style	Renaissance
Oceanic arts	Neoclassicism	Louis XIV style	Rococo style
Paleolithic Period	Constructivism	Louis XV style	Romanesque art
South Asian arts	Coptic art	Louis XVI style	Romanticism
Southeast Asian	Cubism	Mannerism	Stijl, De
arts	Dada	minimalism	Stuart style
<i>historical periods,</i>	Early Christian art	modern art	Surrealism
<i>styles, schools, and</i>	Early	Mozarabic art	Symbolist
<i>movements:</i>	Netherlandish art	naïve art	movement
Aestheticism	Empire style	naturalism	Visigothic art

INDEX: See entries under all of the terms above

Division II. The Particular Arts

[For Part Six headnote see page 221.]

Division I deals generally with the theory and classification of the arts, the experience and criticism of works of art, and the interaction of the arts with social, cultural, and economic institutions.

The outlines in the nine sections of Division II treat the particular arts: literature; theatre; motion pictures; music; dance; architecture, garden and landscape design, and urban design; sculpture; drawing, painting, printmaking, and photography; and the arts of decoration and functional design.

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- 622. Theatre 234
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Section 621. Literature**A. The art of literature**

1. The nature and scope of literature: the distinction between literature and other forms of writing
2. Literary composition
3. The contents of literature: its subject matter

4. Literature and its audience
 5. The integration of literature with other arts
 6. Literary genres: diverse systems of classifying literary works
 7. Writings on literature: theoretical treatises, scholarly research and writing, critical writing
- B. Techniques of literature
1. Rhetoric: the art of discourse
 - a. Elements of rhetoric: figures of speech; *e.g.*, metaphor, simile, personification, hyperbole, allegory, parallelism
 - b. The relation of rhetoric to grammar and syntax, to literary diction and style, and to prosody
 2. Prosody: the manipulation of the elements of language that contribute to acoustic and rhythmic effects in literature
 - a. Elements of prosody
 - i. Rhythmic elements; *e.g.*, accent, beat, cadence, the foot, the stanza, metre
 - ii. Acoustic elements; *e.g.*, rhyme, assonance, alliteration
 - b. Prosodic style: the uses of prosody in verse, prose, drama, and oratory
- C. Kinds of literary composition
1. Poetry: distinctions between verse and prose
 2. Narrative imaginative literature
 - a. Epic; *e.g.*, the “literary” epic, the beast epic, the mock epic, the romantic epic
 - b. Saga: the king’s sagas, legendary sagas, the sagas of Icelanders, and related forms
 - c. Romance: the romance of love, chivalry, and adventure; *e.g.*, Arthurian romance, the pastoral romance, the Gothic romance, the historical romance
 - d. The novel and the tale
 - e. The short story and its antecedents
 - f. Fable, parable, allegory, and related forms
 - g. Ballad, lay, idyll
 3. Dramatic or theatrical literature
 - a. Tragedy
 - b. Comedy
 - c. Tragicomedy
 - d. Farce and related forms
 - e. Melodrama
 - f. Religious drama and ritual
 - g. Radio, motion-picture, and television scripts
 4. Lyric literature
 - a. Music-based lyrics; *e.g.*, ballad, hymn, madrigal
 - b. Language-based lyrics; *e.g.*, sonnet, ode, elegy, pastoral
 5. Satiric literature: satire, parody, lampoon
 6. Nonfictional prose literature
 - a. The essay
 - b. History as literature
 - c. Criticism as literature
 - d. Doctrinal and religious literature
 - e. Philosophical literature
 - f. Political literature
 - g. Polemical literature

- h. Scientific literature
- i. Reportage: journalism
- j. Aphorism, epigram, adage, maxim, and related short forms
- k. The dialogue: philosophical and literary dialogues
- l. Travel literature
- m. Epistolary literature: the letter as literature
- n. The oration, the speech, and related forms
- o. Biographical and autobiographical literature; *e.g.*, character sketch, critical biography, popular biography, interpretive biography, letter, diary, journal, memoir
- 7. Children's literature
- 8. Primitive, folk, and popular literature
[see also 613]
- D. The history of literature
 - 1. Literature of Western peoples
 - 2. Literatures of non-Western peoples
[see also 613]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with literature

General subjects

African Arts	French Literature	Latin Literature	South Asian Arts
American Literature	German Literature	Literature, The Art of	Southeast Asian Arts
American Peoples, Arts of Native	Greek Literature	Literature, The History of	Spanish Literature
Australia and New Zealand, Literatures of	Hebrew Literature	Western	Yiddish Literature
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Cervantes	Dostoyevsky	Johnson, Samuel	Shakespeare
Chaucer	Goethe	Milton	Tolstoy
Dante	Greek Dramatists, The Classical	Molière	Virgil
Dickens		Montaigne	Voltaire

MICROPAEDIA: Selected entries of reference information

General subjects

<i>dramatic literature</i> :	comedy	humours.	revenge tragedy
Absurd, Theatre of the	dialogue	comedy of	Senecan tragedy
anagnorisis	domestic tragedy	intrigue.	sentimental
catharsis	dramatic literature	comedy of	comedy
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Chicago critic
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Freudian criticism
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New Humanism
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 Ossianic ballads
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 Bosman, Herman
 Charles
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 Clark, John Pepper
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*Early Greek and
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Friedrich
Fontane, Theodor
Freiligrath,
Ferdinand
Freytag, Gustav
Frisch, Max
George, Stefan
Goethe, Johann
Wolfgang von
Görres, Joseph von
Gottfried von
Strassburg
Grass, Günter
Grillparzer, Franz
Grimm, Jacob
Ludwig Carl and
Wilhelm Carl
Grimmelshausen,
Hans Jacob
Christoph von
Haller,
Albrecht von
Hartmann
von Aue
Hauptmann,
Gerhart
Hebbel, Friedrich
Heine, Heinrich
Herder, Johann
Gottfried von
Hesse, Hermann
Hoffmann, E.T.A.
Hoffmannsthal,
Hugo von
Hölderlin,
Friedrich
Immermann, Karl
Leberecht
Jean Paul
Johnson, Uwe
Kafka, Franz
Kaiser, Georg
Kaschnitz, Marie
Luise
Keller, Gottfried
- Kleist,
Heinrich von
Mann, Thomas
Meyer, Conrad
Ferdinand
Morgenstern,
Christian
Mörike, Eduard
Friedrich
Novalis
Opitz, Martin
Rilke, Rainer
Maria
Schiller,
Friedrich von
Schnitzler, Arthur
Sternheim, Carl
Stifter, Adalbert
Storm, Theodor
Woldsen
Sudermann,
Hermann
Tieck, Ludwig
Trakl, George
Walafrid Strabo
Walther von der
Vogelweide
Wedekind, Frank
Werfel, Franz
Wieland,
Christoph Martin
Wolfram von
Eschenbach
Zuckmayer, Carl
Zweig, Stefan
- Hebrew writers:*
Agnon, S.Y.
Berdichevsky,
Micah Joseph
Bialik, Hayyim
Nahman
Hisdai ibn Shaprut
ibn Ezra, Moses
Ibn Gabirol
Judah ha-Levi
Zunz, Leopold
- Hungarian writers:*
Ady, Endre
Arany, János
Eötvös, József
Báró
Kazinczy, Ferenc
Petöfi, Sándor
- Indian writers:*
Chatterjee, Bankim
Chandra
Harishchandra
Iqbāl, Sir
Muhammad
Kālidāsa
- Tagore,
Rabindranath
Tulsidās
Italian writers:
Alfieri, Vittorio,
Conte
Amicis,
Edmondo De
Angiolieri, Cecco
Aretino, Pietro
Ariosto, Ludovico
Bacchelli, Riccardo
Bandello, Matteo
Basile,
Giambattista
Belli, Giuseppe
Gioacchino
Betti, Ugo
Boccaccio,
Giovanni
Boiardo, Matteo
María
Buzzati, Dino
Calvino, Italo
Campanella,
Tommaso
Carducci, Giosuè
Casa, Giovanni
Della
Castiglione,
Baldassare
Cavalcanti, Guido
Chiabrera, Grazia
D'Annunzio,
Gabriele
Dante
Eco, Umberto
Folengo, Teofilo
Foscolo, Ugo
Gadda, Carlo
Emilio
Giraldi,
Giambattista
Goldoni, Carlo
Gozzi, Carlo,
Conte
Leopardi,
Giacomo
Levi, Carlo
Machiavelli,
Niccolò
Maffei, Francesco
Scipione
Malaparte, Curzio
Manzoni,
Alessandro
Marinetti, Filippo
Tommaso
Marino,
Giambattista
- Metastasio, Pietro
Montale, Eugenio
Moravia, Alberto
Parini, Giuseppe
Pascoli, Giovanni
Pavese, Cesare
Petrarch
Pirandello, Luigi
Politian
Pratolini, Vasco
Pulci, Luigi
Quasimodo,
Salvatore
Sannazzaro,
Jacopo
Silone, Ignazio
Svevo, Italo
Tasso, Torquato
Tassoni,
Alessandro
Ungaretti,
Giuseppe
Verga, Giovanni
Vittorini, Elio
- Latin-American writers:*
Agustini, Delmira
Alegria, Ciro
Alencar, José de
Amado, Jorge
Asturias, Miguel
Angel
Azuela, Mariano
Bandeira, Manuel
Bello, Andrés
Benedetti, Mario
Bioy Casares,
Adolfo
Blest Gana,
Alberto
Borges, Jorge Luis
Cardenal, Ernesto
Carpentier, Alejo
Cruz, Sor Juana
Inés de la
Cunha, Euclides de
Darío, Rubén
Durão, José de
Santa Rita
Echeverría,
Esteban
Ercilla y Zúñiga,
Alonso de
Fernández de
Lizardi, José
Joaquín
Freyre, Gilberto de
Mello
Fuentes, Carlos
Gallegos, Rómulo

- Gama, Basílio da
García Márquez,
Gabriel
Gonçalves Dias,
Antônio
Graça Aranha,
José Pereira da
Guillén, Nicolás
Guimarães Rosa,
João
Güiraldes, Ricardo
Hernández, José
Herrera y Reissig,
Julio
Huidobro, Vicente
García
Ibarbourou,
Juana de
Icaza, Jorge
Isaacs, Jorge
Lins do Rego
Cavalcanti, José
López y Fuentes,
Gregorio
Lugones, Leopoldo
Lynch, Benito
Machado de Assis,
Joaquim Maria
Mallea, Eduardo
Mármol, José
Martí, José Julián
Mistral, Gabriela
Neruda, Pablo
Nervo, Amado
Olmedo, José
Joaquín
Onetti, Juan
Carlos
Palma, Ricardo
Paz, Octavio
Quiroga, Horacio
Ramos, Graciliano
Reyes, Alfonso
Roa Bastos,
Augusto
Sábato, Ernesto
Sarmiento,
Domingo
Faustino
Silva, José
Asunción
Storni, Alfonsina
Torres Bodet,
Jaime
Vallejo, César
Vargas Llosa,
Mario
Vega, Garcilaso
de la
- Veríssimo, Érico
Zorrilla de San
Martín, Juan
*Middle Eastern
writers:*
Cevdet Paşa,
Ahmed
Edib Adivar,
Halide
Ferdowsi
Gökalp, Ziya
Hâfez
Hakim, Tawfiq al-
Ibn Baṭṭūṭah
Ibn Ḥazm
Jāhiz, al-
Jamalzadeh,
Mohammad Ali
Kemal, Namık
Ma'arrī, al-
Mutanabbī, al-
Omar Khayyam
Sa'di
Taha Hussein
New Zealand writers:
Baxter, James K.
Mansfield,
Katherine
Sargeson, Frank
Sinclair, Sir Keith
Portuguese writers:
Camões, Luís de
Castelo Branco,
Camilo
Deus, João de
Eça de Queirós,
José Maria de
Gonzaga, Tomás
Antônio
Herculano de
Carvalho e
Araújo, Alexandre
Quental, Antero
Tarquínio de
Sá de Miranda,
Francisco de
Vicente, Gil
Vieira, Antônio
Scandinavian writers:
Almqvist, Carl
Jonas Love
Andersen, Hans
Christian
Asbjørnsen, Peter
Christen; and
Moe, Jørgen
Engebretsen
Bergman, Hjalmar
Fredrik Elgérus
- Bjørnson,
Bjørnstjerne
Martinius
Dinesen, Isak
Ewald, Johannes
Fröding, Gustaf
Hamsun, Knut
Holberg, Ludvig,
Friherre Holberg
Ibsen, Henrik
Jensen,
Johannes V.
Lagerkvist, Pär
Lagerlöf, Selma
Laxness, Halldór
Pontoppidan,
Henrik
Rydberg, Viktor
Snorri Sturluson
Strindberg, August
Undset, Sigrid
Wergeland, Henrik
Arnold
Slavic writers:
Akmatova,
Anna
Aksakov, Sergey
Timofeyevich
Andrić, Ivo
Babel, Isaak
Emmanuilovich
Bely, Andrey
Bezruč, Petr
Blok, Aleksandr
Aleksandrovich
Březina, Otakar
Bulgakov, Mikhail
Afanasyevich
Čapek, Karel
Chekhov, Anton
Dostoyevsky,
Fyodor
Ehrenburg, Ilya
Grigoryevich
Fredro, Aleksander
Gogol, Nikolay
Gorky, Maksim
Havel, Václav
Ilf, Ilya; and
Petrov, Yevgeny
Ivanov, Vsevolod
Vyacheslavovich
Jirásek, Alois
Katayev, Valentin
Khomyakov,
Aleksey
Stepanovich
Krléža, Miroslav
Kundera, Milan
- Lermontov,
Mikhail
Lomonosov,
Mikhail
Vasilyevich
Mandelshtam,
Osip Emilyevich
Mayakovsky,
Vladimir
Vladimirovich
Modrzewski,
Andrzej
Pasternak, Boris
Pilnyak, Boris
Potocki, Waclaw
Pushkin,
Aleksandr
Sergeyevich
Rozanov, Vasily
Vasilyevich
Saltykov, Mikhail
Yevgrafovich,
Graf
Seifert, Jaroslav
Sienkiewicz,
Henryk
Sinyavsky, Andrey
Donatovich
Ślōwacki, Juliusz
Solzhenitsyn,
Aleksandr
Szyborska,
Wisława
Tikhonov, Nikolay
Semyonovich
Tolstoy, Leo
Tsvetayeva,
Marina Ivanovna
Turgenev, Ivan
Sergeyevich
Voznesensky,
Andrey
Andreyevich
Yesenin, Sergey
Aleksandrovich
Yevtushenko,
Yevgeny
Zamyatin,
Yevgeny
Ivanovich
Spanish writers:
Alarcón y Ariza,
Pedro Antonio de
Aleixandre,
Vicente
Azorín
Baroja, Pío
Bécquer, Gustavo
Adolfo

Benavente y Martínez, Jacinto	Francisco Gómez de	Frye, Northrop	Schlegel, August
Blasco Ibáñez, Vicente	Rojas, Fernando de	Fuller, Margaret	Wilhelm von
Buero Vallejo, Antonio	Rueda, Lope	Gottsched, Johann	Schlegel,
Calderón de la Barca, Pedro	Ruiz, Juan	Christoph	Friedrich von
Cervantes	Sender, Ramón	Henley, William	Stephen, Sir Leslie
Saavedra, Miguel de	José	Ernest	Wilson, Edmund
Echegaray y Eizaguirre, José	Tamayo y Baus,	Howells, William	<i>Yiddish writers:</i>
Encina, Juan del	Manuel	Dean	Ansky, S.
Espronceda y Delgado, José de	Tirso de Molina	Lamb, Charles	Asch, Sholem
García Lorca, Federico	Torres Naharro,	Leavis, F.R.	Goldfaden,
Góngora y Argote, Luis de	Bartolomé de	Lessing, Gotthold	Abraham
Herrera, Fernando de	Unamuno,	Ephraim	Mendele Moykher
Jiménez, Juan	Miguel de	Lowell, James	Sforim
Ramón	Valera y Alcalá	Russell	Peretz, Isaac Leib
León, Luis de	Galiano, Juan	Mencken, H.L.	Singer, Isaac
Palacio Valdés, Armando	Valle-Inclán,	Menéndez Pidal,	Bashevis
Pardo Bazán, Emilia	Ramón María del	Ramón	<i>other:</i>
Pérez Galdós, Benito	Vega, Garcilaso	Menéndez y	Conscience,
Quevedo y Villegas,	de la	Pelayo, Marcelino	Hendrik
	Vega, Lope de	Merezhkovsky,	Ghelderode,
	Zorrilla y Moral,	Dmitry	Michel de
	José	Sergeyevich	Kazantzákis,
	<i>theorists and critics:</i>	Mochnecki,	Níkos
	Arnold, Matthew	Maurycy	Koraïs,
	Barbey d'Aurevilly,	Ortega y Gasset,	Adamántios
	Jules-Amédée	José	Pramoedya
	Boileau, Nicolas	Papini, Giovanni	Ananta Toer
	Brandes, Georg	Pater, Walter	Verhaeren, Émile
	Breton, André	Roy, Camille	Vondel, Joost
	Burke, Kenneth	Rymer, Thomas	van den
	Empson, Sir	Sainte-Beuve,	
	William	Charles-Augustin	
		Saintsbury, George	

INDEX: See entries under all of the terms above

Section 622. Theatre

A. The art of theatre

1. The nature and origins of theatre as an art
2. Functions of theatre and theatrical production; *e.g.*, theatre as social, moral, or religious expression; theatre as entertainment
3. Problems of theatre and theatrical production
4. Interrelation of theatrical performance and audience
5. The arts of design in the theatre: staging and the design of stages, sets, lights, costumes, and makeup
[see C.2., below]
6. Directing
7. Acting
8. The roles of other arts in the theatre: literature, music, dance, painting, and architecture
[see C., below]

B. Kinds and methods of theatrical production

1. Diverse kinds of theatrical production
 - a. Kinds defined by the nature of the production itself
 - i. The traditional dramatic forms or genres; *e.g.*, tragedy, comedy
[for these forms as literature, see 621.C.3.]

- ii. Dramatic improvisation: commedia dell'arte and related forms
- iii. Mime and pantomime
- iv. Puppet, marionette, and shadow plays and related forms
- v. Nondramatic theatrical production
[see B.1.f., below]
- b. Kinds defined by their special purpose or audience; *e.g.*, religious theatre, civic theatre, educational theatre, court theatre
- c. Kinds defined by their system of production; *e.g.*, single-performance productions, repertory systems, stock companies, touring companies
- d. Kinds defined by the controlling artist; *e.g.*, actor-dominated productions, dramatist-controlled productions, productions controlled by a nonperforming director
- e. Kinds defined by their style: general aesthetic style; styles of particular countries, historical periods, and playwrights
- f. Kinds defined by the lack of a unified dramatic structure
 - i. Circuses and carnivals
 - ii. Pageants, parades, and related forms
 - iii. Popular entertainments: music hall, variety, and burlesque productions; nightclub shows; cabaret; musical comedy and revue
- g. Kinds defined by the cultural character of their audience: primitive, folk, and popular theatre
- h. Kinds defined by their production media: radio and television
- 2. Methods of theatrical production
- C. Elements of theatrical production
 - 1. The production area: theatre buildings, stages, auditoriums
 - a. Theatre as place: kinds and uses of theatre buildings, stages, and auditoriums
 - b. The historical development of theatres in Western and non-Western cultures
 - 2. Staging and stage design: the arrangement of words, dance, music, costumes, makeup, lighting, sound, and properties for theatrical effect
- D. The history of theatre
 - 1. Western theatre
 - 2. Non-Western theatre

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the theatre

African Arts	Folk Arts	Theatre, The Art of the	Theatrical Production
American Peoples, Arts of Native	Oceanic Arts	Theatre, The History of	
Central Asian Arts	Puppetry	Western	
Circus	South Asian Arts		
East Asian Arts	Southeast Asian Arts		

MICROPAEDIA: Selected entries of reference information

General subjects

<i>dramatic conventions and techniques:</i>	actor-manager system	régisseur	<i>movements and tendencies:</i>
agon	chorus	repertory theatre	Absurd, Theatre of the
lazzo	courtyard theatre	skene	biomechanics
soliloquy	directing	Stanislavsky method	Cruelty, Theatre of
<i>elements of theatrical production:</i>	hanamichi	stock company	little theatre
acting	open stage	summer theatre	Living Newspaper
	proscenium	theatre	theatricalism
		theatre-in-the-round	

*popular dramatic
entertainment:*

burlesque show
cabaret
circus
conjuring
Fasching
ice show
masque
mime and
pantomime
minstrel show
music hall and
variety
pageant
revue
shell game
son et lumière
vaudeville
Wild West show

*staging and stage
design:*

cyclorama
deus ex machina
eccyclema
limelight
Linnebach lantern
mansion
multiple setting

pageant wagon
perspective scenery
sound effects
spotlight
stage design
stage machinery
trap

stock characters:

Brighella
Capitano
Columbine
Dottore
Guignol
Harlequin
Kasperle
Miles Gloriosus
Pantaloone
Pedrolino
Punch
Scaramouche
soubrette
zanni

*types of theatrical
production:*

afterpiece
auto sacramental
black theatre
bunraku

ching-hsi
Comédie-Française
Comédie-Italienne
commedia dell'arte
commedia erudita
drame bourgeois
droll
epic theatre
farce
Fastnachtsspiel
interlude
Jesuit drama
kabuki
Karagög
liturgical drama
ludi scaenici
melodrama
miracle play
morality play
mumming play
mystery play
nō theatre
ombres chinoises
Passion play
sacra
rappresentazione
Satyr play
wayang
Yiddish drama

other:

benefit
performance
children's
company
choragus
civic theatre
claque
clown
East Asian arts
Enfants sans Souci
Englische
Komödianten
improvisation
Islamic arts
juggler
Misrule, Lord of
Oceanic arts
peep show
South Asian arts
Southeast Asian
arts
toy theatre
ventriloquism

Biographies*actors and actresses:*

Ashcroft, Dame
Peggy
Barrymore, Lionel
Bernhardt, Sarah
Booth, Edwin
Cooper, Dame
Gladys
Duse, Eleonora
Gwyn, Nell
Irving, Sir Henry
Kean, Edmund
Kemble, John
Philip
Kendal, Dame
Margaret; and
William Hunter
Kortner, Fritz
Lenya, Lotte

Lunt, Alfred; and
Fontanne, Lynn
Mathews, Charles
Murdoch, James
Edward
Nakamura
Utaemon
Neuber, Caroline
Olivier, Laurence
Paxinou, Katina
Siddons, Sarah
Taylor, Laurette
Terry, Ellen
Worth, Irene

directors:

Barrault,
Jean-Louis
Burian, Emil

Craig, Edward
Gordon
Guthrie,
Sir Tyrone
Littlewood,
Joan
Popov, Alexey
Dmitriyevich
Reinhardt, Max
Stanislavsky,
Konstantin
Zavatsky, Yury
Alexandrovich

producers:

Belasco, David
Meyerhold,
Vsevolod
Yemilyevich

Richardson, Tony
Shubert brothers

other:

Barnum, P.T.
Henslowe, Philip
Henson, Jim
Lupino family
Macready, William
Charles
Obraztsov, Sergey
Ringling Brothers

INDEX: See entries under all of the terms above

Section 623. Motion Pictures**A. The art of motion pictures**

1. The nature of motion-picture art: the classification of motion pictures
2. The component arts of motion pictures
 - a. The role of the writer of the script or screenplay
[see 621.C.3.g.]

- b. Motion-picture acting: characteristics that distinguish it from acting in the theatre
- c. The role of the director
- d. The role of the film editor
- e. The use of technology in the creative process: the camera, sound, animation, and other special effects
- 3. Motion-picture production: scenic design, costumes and makeup, lighting, shooting, editing, film processing
- B. The interrelation of other arts in motion pictures: literature, music, dance, painting and drawing, architecture
- C. The nonaesthetic contexts of motion pictures
 - 1. The motion-picture industry
 - 2. Functions of motion pictures: their use as media of education and propaganda
 - 3. The study and appreciation of motion pictures
- D. The history of motion pictures

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major article dealing with motion pictures

Motion Pictures

MICROPAEDIA: Selected entries of reference information

General subjects

animation	documentary film	New Wave	Twentieth
auteur theory	dubbing	newsreel	Century-Fox
cinéma vérité	horror film	Paramount	Film Corporation
CinemaScope	Metro-Goldwyn-Mayer, Inc.	Pictures	underground film
cinematography	montage	Corporation	United Artists
Columbia Pictures	motion picture	reel	Corporation
Entertainment, Inc.	musical film	script	Universal Pictures
		Technicolor	Company
		3-D	Warner Brothers

Biographies

actors and actresses:

Astaire, Fred
 Bergman, Ingrid
 Bogart, Humphrey
 Brando, Marlon
 Chaplin, Charlie
 Crawford, Joan
 Davis, Bette
 de Havilland, Olivia
 De Niro, Robert
 Gable, Clark
 Garbo, Greta
 Gish, Lillian
 Grant, Cary
 Guinness, Sir Alec
 Hepburn, Katharine
 Hoffman, Dustin
 Lloyd, Harold
 March, Fredric
 Mastroianni, Marcello

Mifune Toshirō
 Monroe, Marilyn
 Muni, Paul
 Newman, Paul
 Olivier, Laurence
 Pickford, Mary
 Stewart, James
 Sydow, Max von
 Tracy, Spencer
 Wayne, John
directors:
 Antonioni,
 Michelangelo
 Bergman, Ingmar
 Buñuel, Luis
 Capra, Frank
 Cavalcanti, Alberto
 Clair, René
 DeMille, Cecil B.
 Dreyer, Carl
 Theodor
 Eisenstein, Sergey
 Mikhaylovich

Fellini, Federico
 Ford, John
 Godard, Jean-Luc
 Griffith, D.W.
 Hawks, Howard
 Hitchcock, Sir
 Alfred
 Huston, John
 Kurosawa Akira
 Lean, Sir David
 Lubitsch, Ernst
 Malle, Louis
 Ousmane
 Sembene
 Pabst, G.W.
 Pagnol, Marcel
 Paul
 Ray, Satyajit
 Renoir, Jean
 Rossellini, Roberto
 Sennett, Mack
 Sternberg,
 Josef von

Stroheim,
 Erich von
 Truffaut, François
 Vertov, Dziga
 Welles, Orson
 Wilder, Billy
producers:
 Disney, Walt
 Goldwyn, Samuel
 Korda, Sir
 Alexander
 Mayer, Louis B.
 Selznick, David O.
other:
 Lumière, Auguste
 and Louis
 Mankiewicz,
 Herman
 Muybridge,
 Eadweard
 Westmore family

Section 624. Music

A. The art of music

1. Diverse conceptions of music as an art
2. Problems of musical meaning
3. Musical performance and interpretation
4. The relation of music to other human activities
[see also E.3., below]
5. Writings about music

B. The sources of musical sound

1. The physical aspects of musical sound: tone, movement, pitch, timbre
[see C., below and 128.E.6.]
2. The human voice: techniques, styles, and historical developments of the art of singing in Western and non-Western cultures
3. Musical instruments: the history, technology, and technique of classes and specific types of instruments
 - a. Idiophonic and membranophonic instruments: instruments that produce sound by means of percussion
 - b. Aerophonic instruments: instruments that produce sound by the vibration of a column of air
 - c. Chordophonic instruments: instruments that produce sound by the vibration of struck, plucked, or bowed strings
 - d. Electrophonic instruments: instruments that produce sound by electrical, electromechanical, or electronic means; *e.g.*, electronic organs, tape recorders, synthesizers, computers

C. The elements of music: their patterning and modes of organization in composition

1. Pitch
 - a. Interval: the difference in pitch between two tones
 - b. Scale: a pattern of pitch relationships expressed as a series of intervals dividing an octave
 - c. Tuning and temperament: the organization and modification of systems of pitch relationships
 - d. Motive and theme
 - e. Mode, melody type, tune family
2. Duration (time)
 - a. Metre
 - b. Rhythm
 - c. Tempo
3. Timbre
4. Harmony
5. Counterpoint
6. Texture: monophonic, homophonic, heterophonic, polyphonic
7. Orchestration and instrumentation
8. Form in music: the design and structures whereby musical ideas are presented

D. Musical notation

E. Musical forms and genres: the types of musical composition

1. Forms and genres characterized by the medium of performance
 - a. Instrumental music
[see 2., below]
 - b. Vocal music
 - i. Vocal music for solo performance; *e.g.*, liturgical chant, secular song, lied, aria
 - ii. Choral music; *e.g.*, mass, motet, cantata, oratorio
 - iii. Vocal music for several voices, the parts for either solo or choral performance;
e.g., madrigal, glee
 - c. Electrophonic music; *e.g.*, tape music, computer music
 2. Forms and genres characterized by the technique of composition
 - a. Musical compositions with fully notated structures
 - i. Sonata
 - ii. Symphony
 - iii. Concerto
 - iv. Variation forms; *e.g.*, chaconne, passacaglia, variation set
 - v. Fugue
 - b. Jazz: music combining notated material with extemporaneous performance
 - i. General considerations about jazz: its differentiation from and relation to folk music, popular music, and "art" music; its emphasis on the performer as creator; the importance of improvisation; its reflection of social and cultural forces
 - ii. Development of jazz styles
 3. Forms and genres characterized by function or by social setting
 - a. Liturgical music
 - b. Chamber music
 - c. Music for the theatre
 - i. Opera
 - ii. Music for theatrical dance; *e.g.*, ballet, modern dance
[see also 625]
 - iii. Music theatre; *e.g.*, musical, operetta, zarzuela, nō theatre
[see also 622]
 - iv. Incidental and background music; *e.g.*, for the theatre, for motion pictures and television
 4. Genres determined by the cultural milieu: primitive, folk, and popular music
- F. Recording and reproduction of music
1. Types of music reproduction; *e.g.*, mechanical, magnetic, optical
[see 735.F.]
 2. Techniques of music recording: the role of the producer
 3. Effects of music recording: on composition, on teaching, on criticism, on performance, on musicology
 4. Development of music recording
- G. The history of music
1. Western music
 2. The music of non-Western peoples

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with music

African Arts	East Asian Arts	Musical Forms and Genres	Southeast Asian Arts
American Peoples, Arts of Native	Folk Arts	Musical Instruments	
Bach	Music, The Art of	Oceanic Arts	
Beethoven	Music, The History of Western	South Asian Arts	
Central Asian Arts			

MICROPAEDIA: Selected entries of reference information

General subjects

<i>aerophones—brass instruments:</i>	saxophone	lute	arrangement
alphorn	shakuhachi	mandolin	cadenza
bugle	shawm	mandora	canon
cornet	sheng	p'i-p'a	cantus firmus
euphonium	whistle	rabāb	coda
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 Munch, Charles
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 Jackson, Mahalia
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 Monroe, Bill
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Section 625. Dance

A. The art of dance

1. The nature of dance as art: its origins and functions
2. Choreography and dance notation
3. Diverse classifications of kinds of dance
4. Theoretical, critical, and descriptive writing about dance
5. The integration of dance with other arts: dance in the theatre, in motion pictures
[see 622.C.2. and 623.B.]

B. Ballet

1. The nature of ballet as an art
2. The integration of ballet with other arts; *e.g.*, with opera, drama, motion pictures, television
3. Major kinds of ballet: traditional, classical, modern, abstract, expressive
4. The history of ballet

C. Modern dance

1. Principles underlying modern dance: expression and communication of feeling
2. The relation of modern dance to other arts; *e.g.*, to musical theatre, drama, motion pictures, television
3. Development of modern dance: kinds, theories, techniques, and methods of modern dance

D. Primitive, folk, and popular dance

E. The history of dance

1. The dance of Western peoples
2. The dance of non-Western peoples

Suggested reading in the *Encyclopædia Britannica*:**MACROPAEDIA:** Major articles dealing with dance

African Arts
 American Peoples,
 Arts of Native
 Central Asian Arts
 Dance, The Art of
 Dance, The History
 of Western

East Asian Arts
 Folk Arts
 Oceanic Arts
 South Asian Arts
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MICROPAEDIA: Selected entries of reference informationGeneral subjects*ballet:*

assemblé
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 Ballet comique de
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 ballet movement
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Section 626. Architecture, Garden and Landscape Design, and Urban Design

A. The art of architecture

1. Elements of design and principles of composition
2. Aesthetic aspects of building materials and constructional systems used in architecture
[for technological aspects, see 733]
 - a. Building materials; *e.g.*, stone, brick, wood, iron and steel, concrete
 - b. Constructional systems; *e.g.*, load-bearing wall and nonload-bearing wall, post and lintel, arch, vault, dome, truss, framed structures
3. Diverse structural elements and details of buildings; *e.g.*, floors, walls, ceilings, roofs, windows, doors, stairways
4. Architectural ornamentation: mimetic ornament, applied ornament, organic ornament
5. Diverse kinds of architecture and building types determined by their functions
 - a. Domestic, or residential, architecture; *e.g.*, houses, apartments, castles, hotels
 - b. Religious and commemorative architecture; *e.g.*, temples, churches, synagogues, mosques, tombs, shrines, memorials, monuments
 - c. Governmental architecture; *e.g.*, town halls, capitols, courthouses, post offices
 - d. Recreational architecture; *e.g.*, theatres, auditoriums, athletic facilities, museums, libraries
 - e. Educational and public welfare architecture; *e.g.*, schools and universities, hospitals, prisons, aqueducts
 - f. Commercial and industrial architecture; *e.g.*, office buildings, banks, stores, factories, refineries
 - g. Agricultural architecture; *e.g.*, barns, stables, silos
 - h. Military architecture; *e.g.*, forts, castles, armouries
[see also 736]
6. Primitive and folk architecture
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7. The history of architecture
 - a. Western architecture
 - b. The architecture of non-Western peoples
[see also 613]

B. Garden and landscape design

C. Urban design: the artistic aspects of city planning

[for the sociological, political, economic, and psychological aspects of urban design, see 524.B.; for the technological aspects, see 737.C.2.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with architecture, garden and landscape design, and urban design

African Arts	Folk Arts
American Peoples, Arts of Native	Garden and Landscape Design
Architecture, The Art of	Middle Eastern Arts and
Architecture, The History of Western	Architecture, Ancient
Central Asian Arts	Oceanic Arts
East Asian Arts	South Asian Arts
Egyptian Arts and Architecture, Ancient	Southeast Asian Arts

MICROPAEDIA: Selected entries of reference information

General subjects

<i>architecture—</i>	<i>architecture—</i>	fortification	acroterion
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picturesque
Plateresque
Prairie style
rocaille
Rococo style
Romanesque art
Second Empire style
Shāh Jahān period
architecture
shinden-zukuri
Shingle style
shoin-zukuri
South Asian arts
South Indian temple architecture
Southeast Asian arts
Stijl, De
superposed order
tap'o style
- Tenjiku
Tudor style
türbe
architecture—
other:
architecture
belfry
caravansary
cenotaph
cha-shitsu
columbarium
cortile
court
crannog
entasis
folly
Gujarāt woodwork
high-rise building
hotel dieu
hypostyle hall
kiosk
kiva
mausoleum
megalith
module
- orientation
quadrangle
skyscraper
stela
tholos
tower
triumphal arch
landscape design:
allée
arbor
broderie
cascade
conservatory
English garden
espalier
fountain
gazebo
green theatre
greenhouse
grotto
labyrinth
landscape architecture
nymphaeum
orangery
- park
parterre
pavilion
pergola
topiary
urban design:
acropolis
bastide
boulevard
civic centre
forum
garden city
new town
promenade
urban planning
- Biographies**
architects:
Aalto, Alvar
Adam, Robert
Adler, Dankmar
Alberti, Leon Battista
Behrens, Peter
Bernini, Gian Lorenzo
Blondel, Jacques-François
Borromini, Francesco
Boullée, Étienne-Louis
Bramante, Donato
Breuer, Marcel
Brunelleschi, Filippo
Bulfinch, Charles
Butterfield, William
Cerceau, du, family
Chambers, Sir William
Churriguera family
Corbusier, Le
Delorme, Philibert
Fischer von Erlach, Johann Bernhard
Fuller, R. Buckminster
Garnier, Charles
Gaudí, Antoni
Gropius, Walter
Guarini, Guarino
Hoffmann, Josef
Hunt, Richard Morris
Jenney, William Le Baron
Johnson, Philip C.
Jones, Inigo
Kahn, Albert
Kahn, Louis I.
Kent, William
Klint, Kaare
Latrobe, Benjamin
Ledoux, Claude-Nicolas
Loos, Adolf
Lutyens, Sir Edwin
Mansart, François
Mansart, Jules Hardouin-
Meigs, Montgomery C.
Mendelsohn, Erich
Michelozzo
Mies van der Rohe, Ludwig
Nervi, Pier Luigi
Neutra, Richard Joseph
Niemeyer, Oscar
Olbrich, Joseph
Palladio, Andrea
Pei, I.M.
Pidias
Pietro da Cortona
Pugin, Augustus Welby Northmore
Richardson, Henry Hobson
Root, John Wellborn
Rudolph, Paul
Saarinen, Eero
Sangallo family
Sansovino, Jacopo
Schinkel, Karl Friedrich
Serlio, Sebastiano
Sinan
Soufflot, Jacques-Germain
Stone, Edward Durell
Street, George Edmund
Strickland, William
Sullivan, Louis
Tange Kenzō
Upjohn, Richard
Vanbrugh, Sir John
Venturi, Robert
Vignola, Giacomo da
Viollet-le-Duc, Eugène-Emmanuel
Wagner, Otto
Walter, Thomas
Ustick
White, Stanford
Wren, Sir Christopher
Wright, Frank Lloyd
urban planners:
Brown, Lancelot
Burnham, Daniel H.
Fry, E. Maxwell; and Drew, Jane
Le Nôtre, André
L'Enfant, Pierre-Charles
Loudon, John Claudius
Nash, John
Olmsted, Frederick Law
Repton, Humphry
Soleri, Paolo

Section 627. Sculpture

A. The art of sculpture

1. Elements of design and principles of composition
2. The iconography of sculpture
3. Materials of sculpture; *e.g.*, stone, wood, metal, clay, ivory, plaster, concrete, glass fibre, wax, paper
4. Tools, methods, and techniques of sculpture; *e.g.*, carving, modeling, casting and molding, surface finishing

B. The diverse kinds of sculpture

1. Kinds of sculpture distinguished by their spatial context; *e.g.*, sculpture in the round, relief sculpture, kinetic sculpture, environmental sculpture
2. Kinds of sculpture distinguished by subject matter
 - a. Representational sculpture; *e.g.*, human figures, devotional images and objects, portraits, still lifes, animal figures
 - b. Nonrepresentational sculpture
 - c. Decorative sculpture
3. Kinds of sculpture distinguished by their special uses or functions
 - a. Ceremonial and ritualistic objects
 - b. Coins and medals
 - c. Commemorative sculpture; *e.g.*, monuments, tombs, tombstones, stelae
[see also 626.A.5.b.]
 - d. Masks
4. Primitive and folk sculpture

C. The history of sculpture

1. Western sculpture
2. The sculpture of non-Western peoples

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with sculpture

African Arts	Middle Eastern Arts and Architecture, Ancient
American Peoples, Arts of Native	Oceanic Arts
Central Asian Arts	Sculpture, The Art of
East Asian Arts	Sculpture, The History of Western
Egyptian Arts and Architecture, Ancient	South Asian Arts
Folk Arts	Southeast Asian Arts
Islāmic Arts	
Masks	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>styles:</i>	Eastern Indian	Massim style	Sukhothai style
Amarāvati	bronze	Mathurā art	Tami style
sculpture	Fujiwara style	Northern Wei	Tempyō style
Baroque period	Futurism	sculpture	Tori style
beak style	Gandhāra art	Renaissance	U Thong style
Bhārhut sculpture	Jōgan style	Rococo style	Western Indian
Classicism and	korwar style	Romanesque art	bronze
Neoclassicism	Kushān art	Sānchi sculpture	<i>types:</i>
Cubism	malanggan style	South Indian	bieri
	Mannerism	bronze	

bird stone	kachina	stabile	lost-wax process
colossus	kinetic sculpture	Tanagra figurine	modeling
cylinder seal	kore	telum figure	Oceanic arts
Daedalic sculpture	kouros	terra-cotta	sculpture
death mask	mbulu-ngulu	<i>other:</i>	South Asian arts
environmental	minimalism	African arts	Southeast
sculpture	moai figure	armature	Asian arts
figurehead	mobile	Central Asian arts	
gigaku mask	relief	contrapposto	
gisant	segoni-kun	Gothic art	

Biographies

Ammannati,	Donatello	Houdon,	Pisano, Nicola
Bartolommeo	Epstein, Sir Jacob	Jean-Antoine	Praxiteles
Bernini, Gian	Flaxman, John	Lehmbruck,	Puget, Pierre
Lorenzo	Gabo, Naum	Wilhelm	Rodin, Auguste
Berruguete, Alonso	Ghiberti, Lorenzo	Lipchitz, Jacques	Saint-Gaudens,
Brancusi,	Giacometti,	Lysippus	Augustus
Constantin	Alberto	Maillol, Aristide	Sluter, Claus
Brunelleschi,	Giambologna	Michelangelo	Smith, David
Filippo	Gill, Eric	Milles, Carl	Thorvaldsen,
Calder, Alexander	Girardon, François	Moore, Henry	Bertel
Canova, Antonio	Hepworth, Dame	Myron	Tinguely, Jean
Cellini, Benvenuto	Barbara	Oldenburg, Claes	Verrocchio,
Della Robbia,	Hildebrand,	Phidias	Andrea del
Luca	Adolf von	Pisano, Giovanni	

INDEX: See entries under all of the terms above

Section 628. Drawing, Painting, Printmaking, and Photography
A. Drawing

1. Elements of design and principles of composition
2. Drawing media; *e.g.*, chalk, charcoal, crayon, ink, pastel, pencil, scratchboard, silverpoint, wash
3. Diverse kinds of drawing
 - a. Kinds of drawing determined by subject matter; *e.g.*, portraits, landscapes, figure compositions, still lifes
 - b. Kinds of drawing determined by special uses
[for aspects of drawing related to writing, see 629.C.4.]
 - i. Animation
 - ii. Caricature, cartoon, comic strip
 - iii. Cartography and mapping
 - iv. Drafting
4. The history of drawing

B. The art of painting

1. Elements of design and principles of composition
2. The iconography of painting
3. Painting media; *e.g.*, acrylic, casein, encaustic, fresco, gouache, ink, oil, tempera, watercolour
4. Related media and techniques
 - a. Calligraphy
[see 629.C.4.a.]
 - b. Drawing
[see A., above]
 - c. Mosaic

- d. Photography
[see D., below]
- e. Printmaking
[see C., below]
- f. Stained glass
- g. Tapestry
- 5. The kinds of painting
 - a. Kinds of painting determined by the type or form of the physical object on which the picture is painted
 - i. Fixed objects; *e.g.*, cave painting, mural painting
 - ii. Movable objects: easel painting, fan painting, manuscript illumination, miniature painting, screen painting, scroll painting
 - b. Kinds of painting determined by subject matter
 - i. Representational painting; *e.g.*, devotional painting, genre painting, landscape painting, narrative painting, portrait painting, still-life painting
 - ii. Nonrepresentational painting
 - c. Kinds of painting determined by the maker or by the audience: primitive and folk painting
- 6. The history of painting
 - a. Western painting
 - b. The painting of non-Western peoples
- C. Printmaking
 - 1. Printmaking as an art: its characteristics and problems; *e.g.*, the problem of originality versus reproduction
 - 2. Printmaking media
 - a. Relief or cameo media; *e.g.*, woodcuts and linoleum cuts, wood engraving
 - b. Intaglio media; *e.g.*, aquatint, drypoint, etching, lift-ground prints, line engraving, mezzotint, soft-ground prints, stipple engraving
 - c. Surface media: lithography, monoprint, serigraphy
 - 3. Printmaking tools and techniques
[see 735.E.4.]
 - 4. The history of printmaking
- D. Photography as an art
 - 1. The nature and problems of photography as an art
 - 2. Photographic equipment and techniques: lenses; cameras; exposure, processing, and printing
[see 735.G.]
 - 3. The kinds of photography
 - a. Major kinds of photography determined by subject matter; *e.g.*, portraits, landscapes
 - b. Kinds of functional photography; *e.g.*, photojournalism and photo reportage, astronomical photography, aerial photography, radiography
 - 4. The history of photography

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with drawing, painting, printmaking, and photography

General subjects

Caricature, Cartoon,
and Comic Strip

Drafting

Drawing

Folk Arts

Mapping and Surveying

Painting, The Art of

Painting, The

History of Western

Photography

Printmaking

Biographies

Leonardo da Vinci
MichelangeloPicasso
RembrandtTitian
Velázquez

MICROPAEDIA: Selected entries of reference information

General subjects

*drawing:*aerial perspective
anamorphosis
animation
blot drawing
brush drawing
caricature
cartography
cartoon
chalk drawing
charcoal drawing
chiaroscuro
comic strip
crayon
drapery
drawing
écorché
foreshortening
isometric drawing
line-and-wash
drawing
metal point
pastel
pen drawing
pencil drawing
perspective
sanguine
scratchboard
sggraffito
silhouette
sketch
squaring
wash drawing*mosaics and stained**glass:*commesso
Cosmati work
emblemata
gemmail
mosaic
opus sectile
opus tassellatum
opus vermiculatum
pebble mosaic
pietra dura
stained glass
tessera
tessellated
pavement*painting:*aerial perspective
anamorphosis
bark painting
casein painting
draperyencaustic painting
gesso
gouache
grisaille
oil painting
painting
panel painting
perspective
sand painting
sizing
tempera painting
watercolour*photography:*albumen paper
carte-de-visite
Fotoform
gelatin process
Group f.64
Linked Ring
Photo-Secession
Group
photomontage
tintype
vortograph*prehistoric painting:*Altamira
Font-de-Gaume
Franco-Cantabrian
school
Gargas
Lascaux Grotto
macaroni
Tassili-n-Ajjer
Trois Frères, Les
X-ray style*printing:*aquatint
bookplate
cliché-verre
decal
drypoint
embossing
engraving
etching
ink
intaglio
linocut
lithography
mezzotint
monotype
printmaking
relief printing
rubbing
stencillingwood engraving
woodcut
styles of painting—
Chinese:
Ch'an painting
Che school
Eight Eccentrics of
Yang-chou
Eight Masters of
Nanking
Four Masters of
Anhui
Four Masters
of the Yüan
Dynasty
kung-pi
Ma-hsia school
p'o-mo
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Six Masters of
the early Ch'ing
period
ts'un
wen-jen-hua
Wu school*styles of painting—**Indian:*Basohli painting
Bündi painting
Deccani painting
Eastern Indian
painting
Kālighāt painting
Kishangarh
painting
Mālwa painting
Mewār painting
Mughal painting
Pahari painting
Rājasthānī
painting
South Asian arts
Western Indian
painting*styles of painting—**Islāmic:*Baghdad school
Esfahān school
Herāt school
Islāmic arts
Jalāyirid school
Mosul school
Shirāz school
Tabriz school*styles of painting—**Japanese:*chinsō
Kanō school
Nan-ga
nise-e
scroll painting
Shijō school
suiboku-ga
Tosa school
Ukiyo-e
Yamato-e*styles of painting—**Western:*Abstract
Expressionism
Abstraction-Création
Action painting
Ada group
Antwerp
Mannerists
art brut
Automatism
Avignon school
Bambocciati
Barbizon school
Biedermeier style
Blauwe Reiter, Der
Bolognese school
Brücke, Die
Camden Town
group
Cobra
Cubism
Dada
Danube school
Düsseldorf school
Eight, The
English school
Fauvism
fête champêtre
Flemish art
Fontainebleau,
school of
fore-edge painting
Futurism
genre painting
Geometric style
Ghent-Bruges
school
Hiberno-Saxon
style
Hudson River
school
Impressionism

Intimism
 Italianate painters
 Jack of Diamonds
 Japanism
 London group
 Luminism
 Macchiaioli
 Metaphysical
 painting
 minimalism
 Moscow school
 Nabis
 Nazarene
 Neo-Expressionism
 Neo-Impressionism
 Neue
 Künstlervereinigung
 Neue Sachlichkeit
 New York school
 Norwich school

Novgorod school
 Op art
 Orphism
 Peredvizhniki
 plein air painting
 Pont-Aven school
 Pop art
 Postimpressionism
 Pre-Raphaelite
 Brotherhood
 Precisionism
 Pskov school
 Purism
 Rayonism
 Romanticism
 singerie
 Social Realism
 still-life painting
 Stroganov school
 Suprematism

Surrealism
 Symbolist
 movement
 Synchromism
 Synthetism
 Tachism
 tondo
 trompe l'oeil
 Utrecht school
 vanitas
 veduta
 Venetian school
 Vingt, Les
 Vladimir-Suzdal
 school
 Winchester school
 Worpswede school
styles of painting—
other:
 African arts

Amarna style
 Central Asian arts
 Egyptian art
 Sogdian art
 Southeast
 Asian arts
 wandjina style
other:
 collage
 diorama
 folk art
 limner
 mural
 panorama
 popular art
 Poussinist
 Rubenist
 tapestry

Biographies

illustrators:

Beardsley, Aubrey
 Beerbohm,
 Sir Max
 Crane, Walter
 Daumier, Honoré
 Gibson, Charles
 Dana
 Leech, John
 Nast, Thomas
 Pyle, Howard
 Rockwell, Norman
 Thurber, James

painters—British:

Burne-Jones, Sir
 Edward Coley
 Constable, John
 Gainsborough,
 Thomas
 Hogarth, William
 Lawrence, Sir
 Thomas
 Lewis, Wyndham
 Millais, Sir John
 Everett, 1st
 Baronet
 Palmer, Samuel
 Reynolds, Sir
 Joshua
 Rossetti, Dante
 Gabriel
 Stubbs, George
 Turner, J.M.W.
 Wilson, Richard

painters—Dutch:

Bosch,
 Hiëronymus
 Bouts, Dirck
 Cuyp, Aelbert
 Jacobsz

Gogh, Vincent van
 Hals, Frans
 Mondrian, Piet
 Rembrandt
 Harmenszoon
 van Rijn
 Ruisdael,
 Jacob van
 Scorel, Jan van
 Steen, Jan
 Terborch, Gerard
 Vermeer, Jan

painters—East Asian:

Hasegawa, Tōhaku
 Hiroshige
 Hokusai
 Hsia Kuei
 Ma Yüan
 Ogata Kōrin
 Sesshū
 Shiba Kōkan
 Tomioka Tessai
 Tung Ch'i-ch'ang

painters—Flemish:

Bruegel, Pieter, the
 Elder
 Campin, Robert
 David, Gerard
 Eyck, Jan van
 Goes, Hugo
 van der
 Mabuse, Jan
 Massys, Quentin
 Memling, Hans
 Rubens, Peter Paul
 Van Dyck, Sir
 Anthony
 Weyden, Rogier
 van der

painters—French:

Bonnard, Pierre
 Bourdon, Sébastien
 Braque, Georges
 Cézanne, Paul
 Chardin,
 Jean-Baptiste-Siméon
 Claude Lorrain
 Corot, Camille
 Courbet, Gustave
 David,
 Jacques-Louis
 Degas, Edgar
 Delacroix, Eugène
 Duchamp, Marcel
 Fouquet, Jean
 Fragonard,
 Jean-Honoré
 Gauguin, Paul
 Géricault,
 Théodore

Gros,

Antoine-Jean,
 Baron

Ingres,

Jean-Auguste-
 Dominique
 Le Brun, Charles
 Léger, Fernand
 Manet, Édouard
 Matisse, Henri
 Monet, Claude
 Pissarro, Camille
 Poussin, Nicolas
 Renoir,
 Pierre-Auguste
 Rouault, Georges
 Rousseau, Henri
 Seurat, Georges

Toulouse-Lautrec,
 Henri de
 Vuillard, Édouard
 Watteau, Antoine

painters—German:

Cranach, Lucas,
 the Elder
 Dürer, Albrecht
 Ernst, Max
 Grünewald,
 Matthias
 Holbein, Hans, the
 Elder
 Holbein, Hans, the
 Younger
 Kirchner, Ernst
 Ludwig
 Lochner, Stefan
 Marc, Franz
 Nolde, Emil
 Pacher, Michael

painters—Italian:

Andrea del Sarto
 Angelico, Fra
 Antonello da
 Messina
 Bassano, Jacopo
 Bellini, Gentile
 Bellini, Giovanni
 Bellini, Jacopo
 Boccioni, Umberto
 Botticelli, Sandro
 Bramantino
 Canaletto
 Caravaggio
 Carracci, Annibale
 Castagno,
 Andrea del
 Cavallini, Pietro
 Cimabue

Correggio	Tintoretto	Motherwell,	Cartier-Bresson,
Crespi, Giovanni	Titian	Robert	Henri
Battista	Uccello, Paolo	O'Keeffe, Georgia	Emerson, Peter
Crivelli, Carlo	Veronese, Paolo	Peale, Charles	Henry
Duccio di	Vitale da Bologna	Willson	Evans, Walker
Buoninsegna	<i>painters—Spanish:</i>	Pollock, Jackson	Frank, Robert
Gaddi, Taddeo	Dalí, Salvador	Rothko, Mark	Hine, Lewis
Gentileschi, Orazio	Goya, Francisco de	Sargent, John	Wickes
Ghirlandajo,	Greco, El	Singer	Nadar
Domenico	Miró, Joan	Shahn, Ben	Ray, Man
Giorgione	Murillo, Bartolomé	Warhol, Andy	Robinson, Henry
Giotto de Bondone	Esteban	Whistler, James	Peach
Giovanni di Paolo	Picasso, Pablo	McNeill	Sander, August
Giulio Romano	Ribera, José de	Wood, Grant	Siskind, Aaron
Leonardo da Vinci	Velázquez de	Wyeth, Andrew	Smith, W. Eugene
Lippi, Fra Filippo	Cuéllar, Diego	<i>painters—other:</i>	Steichen, Edward
Lorenzetti, Pietro	Zurbarán,	Behzad	Stieglitz, Alfred
Lotto, Lorenzo	Francisco de	Chagall, Marc	Strand, Paul
Mantegna, Andrea	<i>painters—United</i>	Clouet, Jean	Weston, Edward
Martini, Simone	<i>States:</i>	Kandinsky,	White, Minor
Masaccio	Allston,	Wassily	<i>printmakers and</i>
Masolino	Washington	Klee, Paul	<i>engravers:</i>
Michelangelo	Beckmann, Max	Kokoschka, Oskar	Bewick, Thomas
Modigliani,	Benton, Thomas	Loutherbourg,	Blake, William
Amedeo	Hart	Philip James de	Bresdin, Rodolphe
Orcagna, Andrea	Bingham, George	Munch, Edvard	Callot, Jacques
Parmigianino	Caleb	Orozco, José	Currier, Nathaniel;
Perugino	Cassatt, Mary	Clemente	and Ives, James
Piazzetta,	Cole, Thomas	Rivera, Diego	Duvet, Jean
Giovanni Battista	Curry, John	<i>photographers:</i>	Klinger, Max
Piero della	Steuart	Abbott, Berenice	Kollwitz, Käthe
Francesca	Davis, Stuart	Adams, Ansel	Lucas van Leyden
Piero di Cosimo	de Kooning,	Arbus, Diane	Méryon, Charles
Pisanello, Il	Willem	Atget, Eugène	Raimondi,
Primaticcio,	Eakins, Thomas	Bourke-White,	Marcantonio
Francesco	Frankenthaler,	Margaret	Schongauer,
Raphael	Helen	Brady, Mathew B.	Martin
Roberti,	Gorky, Arshile	Brandt, Bill	Villon, Jaques
Erocole de'	Homer, Winslow	Brassaï	
Signorelli, Luca	Hopper, Edward	Cameron, Julia	
Tiepolo, Giovanni	Hurd, Peter	Margaret	
Battista	Inness, George	Capa, Robert	

INDEX: See entries under all of the terms above

Section 629. Arts of Decoration and Functional Design

- A. The nature and scope of the arts of decoration and functional design
- B. The kinds of decorative arts and types of decorative objects classified by the materials and methods used to produce or decorate them, or both
 1. Clay; *e.g.*, earthenware, stoneware, porcelain
 2. Fabrics
 3. Gems
 4. Glass
 5. Metals
 6. Paper; *e.g.*, papier-mâché, wallpaper
 7. Stone

8. Wood
9. Other kinds of inorganic materials
with special attention to
 - a. Plaster, cement, and concrete
 - b. Plastics and other synthetic materials
10. Other kinds of organic materials
with special attention to
 - a. Flowers, foliage, and related botanical materials; *e.g.*, bouquets, garlands, wreaths
[for garden and landscape design, see 626.B.]
 - b. Plant fibres, reeds, branches, and related materials; *e.g.*, baskets, mats
 - c. Skins, furs, and related materials
 - d. Shell, horn, bone, ivory, and related materials
 - e. Wax
11. Special decorative finishing materials, processes, and techniques
 - a. Enamelwork; *e.g.*, cloisonné, champlevé, painted enamels
 - b. Lacquerwork; *e.g.*, carved lacquer, inlaid lacquer, laque burgauté
 - c. Inlay work; *e.g.*, veneering, intarsia, marquetry
- C. The arts of functional design: kinds and types of artistic object classified by their function
 1. Dress design and body decoration
 - a. Dress and dress accessories
[for the technological aspects of garment making, see 732.B.3.]
 - b. Jewelry
 - c. Body decoration: cosmetics; hairdressing and hair adornment; physical modification; perfumes, scents, and fragrances
 2. Industrial design
 - a. Industrial design as an art
 - b. Diverse kinds of industrial design classified by function; *e.g.*, design of commercial equipment, design of communications equipment, design of household appliances, design of transportation equipment
 3. Interior design
 - a. Interior design as an art
 - b. The integration of interior design and decoration with architecture: the design and decoration of interior architectural elements
 - i. Ceilings
 - ii. Floors
 - iii. Floor coverings; *e.g.*, rugs, carpets, mats
 - iv. Walls; *e.g.*, molding, paneling, wallpaper
 - v. Windows and doors
 - vi. Other interior architectural elements; *e.g.*, heating units, stairs and staircases
 - c. Objects used for interior decoration: furniture and accessory furnishings
[for technological aspects, see 732.B.4.]
 4. The design of materials and objects for communication and identification
 - a. Handwriting systems and styles: calligraphy, lettering, illuminating
[for forms of writing, see 514.E.]
 - b. Printing arts: typography and printing design, illustration, bookbinding
[for printmaking, see 628.C.]
 - c. Advertising art and design
 - d. The design of signs and symbols used primarily for identification; *e.g.*, heraldic design
 - e. The design of exhibitions and displays; *e.g.*, museum and gallery display

5. The design and decoration of diverse kinds of specialized functional objects
 - a. The design of coins and currency and of medals
 - b. The design and decoration of play materials
 - c. Automata: the design of decorative mechanical objects
 - d. The design and decoration of arms
[for the technological aspects of arms, see 736]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the arts of decoration and functional design

African Arts	East Asian Arts	Printing,	Southeast Asian
Central Asian Arts	Folk Arts	Typography, and	Arts
Decorative Arts	Heraldry	Photoengraving	Writing
and Furnishings	Marketing and	South Asian Arts	
Dress and	Merchandising		
Adornment	Oceanic Arts		

MICROPAEDIA: Selected entries of reference information

General subjects

<i>body decoration:</i>	Art Deco	<i>dress and adornment:</i>	stomacher
barber	Art Nouveau	aigrette	suit
body modifications	Arts and Crafts	buckle	surcoat
and mutilations	Movement	bustle	sweater
hairstressing	auricular style	button	swimsuit
mustache	Biedermeier style	Chilkat weaving	tippet
tattoo	Central Asian arts	chiton	toga
toupee	chinoiserie	cockade	trousers
wig	curvilinear style	codpiece	tunic
<i>calligraphy:</i>	Directoire style	commode	turban
black letter	Empire style	corset	yashmak
bokuseki	Gates of Paradise	crinoline	<i>enameling and</i>
calligraphy	ghaṭa-pallava	dhōti	<i>enamelware:</i>
cancellaresca	Islāmic arts	doublet	Battersea
corsiva	istoriato style	dress	enamelware
Carolingian	Koguryō style	fan	Canton enamel
minuscule	Louis XIII style	farthingale	champlevé
chia-ku-wen	Louis XIV style	glove	cloisonné
chrysography	Louis XV style	hat	en résille
hsiao-chuan	Louis XVI style	hoop skirt	enamel miniature
Insular script	Mosan school	hosiery	enamelwork
italic script	Mosul school	inrō	Limoges painted
ku-wen	Oceanic arts	kashmir shawl	enamel
Kūfic script	patralatā	kimono	<i>floral and foliage</i>
li-shu	Proto-Geometric	loincloth	<i>decorations:</i>
majuscule	style	moccasin	floral decoration
Merovingian script	Queen Anne style	pajamas	garland
minuscule	Régence style	p'ao	ikebana
naskhī script	Regency style	paṭolā	Ikenobō
palimpsest	rocaille	peplos	Ko
rubrication	Scythian art	petticoat	lei
ta-chuan	South Asian arts	Phrygian cap	moribana
ta'liq script	Southeast	poke bonnet	nageire
testegiatta	Asian arts	redingote	nosegay
ts'ao-shu	Turkish style	ruff	Ohara
uncial	William and Mary	sandal	rikka
<i>decorative art styles</i>	style	sari	shōka
<i>and motifs:</i>	vyāla	shawl	wreath
African arts		shoe	zen'ei ikebana
arabesque		sokutai	

*furniture and**accessories:*

Act of Parliament
clock
armoire
banjo clock
bath chair
bed
bedspread
bench
bentwood furniture
bonheur du jour
bookcase
bureau
cabinet
cabriole leg
cane furniture
Carlton House
table
cassone
cellarette
chair
chest
chest of drawers
cheval glass
Chippendale
coffer
commode
console
corner furniture
couch
court cupboard
cupboard
davenport
desk
dresser
dressing table
drop-leaf table
drum table
Early American
furniture
escutcheon
furniture
gateleg table
highboy
klismos
ladder-back chair
love seat
marquetry
ming ch'i
ogee clock
ottoman
Parsons table
Pembroke table
pew
pillar and scroll
shelf clock
prie-dieu
scissors chair
secretary

settee
settle
Shaker furniture
sideboard
stool
table
taboret
throne
tilt-top table
tripod
trundle bed
upholstery
vargueno
veneer
wainscot chair
wardrobe
whatnot
wickerwork
Windsor chair

glassware:

Altare glass
amberina glass
Amelung glass
Baccarat glass
Blaschka glass
Bohemian glass
cameo glass
crown glass
crystallo ceramie
cut glass
engraved glass
etched glass
façon de Venise
flint glass
Hedwig glass
Humpen glass
lustrated glass
Mary Gregory
glass
millefiori glass
mosaic glass
Mughal glass
opaline glass
perfume bottle
Portland Vase
pressed glass
Römer
ruby glass
Sandwich glass
satin glass
Venetian glass
verre églomisé
Waterford glass
witch ball
Zwischengoldgläser

*heraldry, arms, and
insignia*

armorial ensign
arms, coat of
ecclesiastical
heraldry

fascies
flag
fleur-de-lis
herald
heraldic memorial
heraldry
labarum
monogram
orb
sceptre
tartan

*interior design**accessories:*

chandelier
Coromandel
screen
curtain
doorstop
mirror
molding
niche
paneling
sconce
toko-no-ma
wainscot
wallpaper

*jewelry and**gemstones:*

agate
almandine
amethyst
andradite
armlet
aventurine
baroque pearl
bead
beryl
birthstone
brooch
cameo
carat
carnelian
cat's-eye
chatelaine
Chinese jade
choker
chrysoberyl
citrine
coronet
crown
crown jewels
cultured pearl
diamond
diamond cutting
earring
emerald
fibula
filigree
Florentine
diamond

garnet
gemstone
granulation
hei tiki
jadeite
jewelry
lapis lazuli
lip ring, lip plug,
and lip plate
magatama
nephrite
netsuke
nose ring
onyx
opal
parure
pearl
pendant
peristerite
phenakite
ring
ruby
ruby spinel
sapphire
sard and sardonyx
topaz
torque
ts'ung
turquoise
variscite
watch fob
zircon

*lacquerwork and**related techniques:*

chinkin-bori
decoupage
fundamiji
gilding
hiramaki-e
hirameji
japanning
Kamakura-bori
kanshitsu
lacquerwork
laque burgauté
maki-e
nashiji
raden
ró-iro
togidashi maki-e

*metalwork and**metalware:*

Bidri ware
britannia metal
bronze work
candle cup
chasing
chia
chien
chüeh

- chung
 copper work
 cruse lamp
 damascening
 dinanderie
 dōtaku
 fang-i
 fu
 gold leaf
 golden rose
 goldwork
 hallmark
 Häufbecher
 ho
 hollowware
 horse brass
 hu
 incense burner
 ironwork
 Jungfrauenbecher
 karat
 kovsh
 kuang
 kuei
 leadwork
 li
 Luristan Bronze
 medal
 metalwork
 nef
 niello
 ormolu
 p'an
 pierced work
 pomander
 Pontypool ware
 pyx
 saltcellar
 samovar
 sauceboat
 Sheffield plate
 silverwork
 snuffer
 steeple cup
 sterling
 tankard
 tea and coffee
 service
 tinware
 toleware
 touchstone
 trivet
 yu
*pottery—earthenware
 and stoneware:*
 Abtbessingen
 faience
 agateware
- albarello
 amphora
 Aprey faience
 Astbury ware
 Bartmannkrug
 basaltes ware
 Bizen ware
 black-figure
 pottery
 bucchero ware
 Cafaggiolo
 majolica
 cauliflower ware
 celadon
 Chien ware
 comb pottery
 creamware
 Deruta ware
 Doulton ware
 earthenware
 Enghalskrug
 Faenza majolica
 faience
 faience fine
 Greek pottery
 Hafner ware
 Haji ware
 Hausmalerei
 Hispano-Moresque
 ware
 ironstone china
 jasperware
 Kreussen
 stoneware
 Liverpool delft
 lustreware
 Lyon faience
 majolica
 Marseille faience
 mezza majolica
 Minton ware
 Moustiers faience
 Nevers faience
 Niderviller ware
 Norwich ware
 Orvieto ware
 Pan-shan ware
 Paterna ware
 pottery
 Pueblo pottery
 punch'ōng
 pottery
 raku ware
 red-figure pottery
 Rockingham
 ware
 Rörstrand faience
- Rouen ware
 Saint-Amand-les-Eaux
 ware
 Savona faience
 Southwark and
 Lambeth
 delftware
 Staffordshire figure
 stoneware
 Strålsund faience
 Strasbourg ware
 terra-cotta
 terra sigillata ware
 tin-glazed
 earthenware
 ting
 Ting ware
 tortoiseshell ware
 Tz'u-chou ware
 Urbino maiolica
 Venice majolica
 Vincennes ware
 Wedgwood ware
 Westerwald
 stoneware
 Zürich ware
pottery—porcelain:
 Affenkäpelle ware
 Belleek ware
 Berlin ware
 bone china
 Bow porcelain
 Bristol ware
 Buen Retiro ware
 caddy
 Capodimonte
 porcelain
 carrack porcelain
 Caughley ware
 Chantilly porcelain
 Chelsea porcelain
 Coalport porcelain
 Derby ware
 deutsche Blumen
 Doccia porcelain
 Doulton ware
 eggshell porcelain
 flambé glaze
 Hausmalerei
 Imari ware
 Jesuit ware
 Kakiemon ware
 Karatsu ware
 Ki Seto ware
 Kutani ware
 Kyō-yaki
 Limoges ware
- ling lung ware
 lithophane
 Liverpool
 porcelain
 Longton Hall
 porcelain
 Lowestoft
 porcelain
 Medici porcelain
 Meissen porcelain
 Mikawachi
 porcelain
 Minton ware
 Niderviller ware
 Nymphenburg
 porcelain
 Oribe ware
 Petit porcelain
 Plymouth
 porcelain
 Rockingham ware
 Rouen ware
 Royal Copenhagen
 porcelain
 Saint-Amand-les-Eaux
 ware
 Saint-Cloud
 porcelain
 Seto ware
 Sèvres porcelain
 Shino ware
 Spode porcelain
 Strasbourg ware
 Swatow wares
 Te-hua porcelain
 Tournai porcelain
 Vienna porcelain
 Vincennes ware
 Worcester
 porcelain
 ying-ch'ing ware
 Zürich ware
pottery—other:
 alabastron
 potter's mark
 pottery
 slipware
 transfer printing
printing arts:
 black letter
 block book
 bookbinding
 italic
 Romain du Roi
 roman
 sans serif
 typography

textile arts—lace:

Alençon lace
 blonde lace
 bobbin lace
 Brussels lace
 Buckinghamshire
 lace
 Genoese lace
 lace
 lace pattern book
 needle lace
 Spanish lace
 Valenciennes
 lace
 Venetian needle
 lace

*textile arts—**needlework:*

bargello work
 beadwork
 Berlin woolwork
 broderie anglaise
 chikan work
 crewel work
 embroidery
 needlepoint
 opus anglicanum
 petit point
 quillwork
 raised work
 sampler
 whitework

*textile arts—rugs and
carpets:*

Admiral carpet
 Afghan carpet
 Alcaraz carpet
 Ardabil Carpet
 Arraiolos rug
 Aubusson carpet
 Axminster carpet
 Baku rug
 Balochi rug

Bergama carpet
 Bijār carpet
 bird rug
 Bokhara rug
 Chichi rug
 Chodor carpet
 Cuenca carpet
 Dagestan rug
 Damascus rug
 Dragon rug
 Ersari carpet
 Ferahan carpet
 Garden carpet
 Ghiordes carpet
 Hamadan rug
 Hatchlu rug
 Herāt carpet
 Hereke carpet
 Heriz carpet
 Indo-Eşfahān
 carpet
 Joshagan rug
 Karabagh rug
 Kāshān carpet
 Kazakh rug
 Kermān carpet
 Khorāsān carpet
 Khotan rug
 kilim
 Kirshehr rug
 Konya carpet
 Kuba carpet
 Kula carpet
 Kurdish rug
 Lādik carpet
 Lotto carpet
 medallion carpet
 Mekri carpet
 Melas carpet
 Mughal carpet
 Mujur rug
 Ottoman carpet

palas
 prayer rug
 Qashqā'i rug
 rug and carpet
 rya rug
 Salor rug
 Sarūk carpet
 Savonnerie
 carpet
 Senna rug
 Seraband rug
 Shirāz rug
 Shirvan rug
 Smyrna carpet
 Soumak
 Spring of Khosrow
 Carpet
 Tabrīz carpet
 Tekke carpet
 Transylvanian
 rug
 Ushak carpet
 Vase carpet
 Verné rug
 Yomut carpet
 Yürük rug

textile arts—other:

bāndhanī work
 crochet
 jām-dānī
 kimkhwāb
 knitting
 Navajo weaving
 paisley
 qalamkāri textile
 quilting
 tapestry
 tatting
 textile
 toile de Jouy
 verdure tapestry
 weaving

other:

altarpiece
 ampulla
 aryballos
 automaton
 azulejo
 basketry
 Bauhaus
 billboard
 cha-shitsu
 Christmas tree
 decorative art
 Deutscher
 Werkbund
 effigy mound
 featherwork
 frame design
 interior design
 ivory carving
 kirikane
 krater
 mazer
 paper folding
 papier-mâché
 parfleche
 patch box
 pichhwāi
 pilgrim bottle
 piqué work
 poster
 retable
 sandwich board
 sign
 snuffbox
 t'ao-t'ieh
 tatami
 tea ceremony
 tester
 tortoiseshell
 totem pole
 trencher
 umbrella
 yurt

Biographies

Aalto, Alvar
 Asam, Cosmas
 Damian; and
 Asam, Egid
 Quirin
 Astbury, John
 Boulle,
 André-Charles
 Breuer, Marcel
 Chippendale,
 Thomas
 Cressent, Charles
 Deskey, Donald

Didot family
 Eames, Charles;
 and Eames, Ray
 Exekias
 Fortuny, Mariano
 Gallé, Émile
 Germain, Thomas
 Gill, Eric
 Goddard family
 Hepplewhite,
 George
 Klint, Kaare

Majorelle, Louis
 Mardersteig,
 Giovanni
 Mi Fei
 Morison, Stanley
 Morris, William
 Northwood, John
 Palissy, Bernard
 Phyfe, Duncan
 Pisanello, Il
 Poggio Bracciolini,
 Gian Francesco

Roentgen, David
 Saarinen, Eero
 Sheraton, Thomas
 Sōtatsu
 Tassie, James
 Thonet, Michael
 Tiffany, Louis
 Comfort
 Townsend family
 Wedgwood, Josiah
 Wood family

Introduction to Part Seven:

Knowing How and Knowing Why

by Lord Ritchie-Calder

Benjamin Franklin defined man as “the tool-making animal.” If he had added the phrase “with foresight,” he would have adequately described *Homo faber*, man the technologist.

Inventiveness was the indispensable condition for the survival of the human species. Without fur or feather, carapace or scale, ancestral man stood naked to the elements; and without fang or claw or tusk to fight his predators, without speed to elude them, without camouflage to deceive them or the ability to take to the trees like his cousin, the ape, he was physically at a hopeless disadvantage. What he developed to deal with his deficiencies was the capacity to invent. He possessed not only sensory perceptions (though these were less acute than those of many of his fellow creatures), he also possessed imagination and finger-skills. He did not just improvise to meet an emergency as an ape might in using a broken branch as a weapon; he also saw the need for keeping a club handy—he planned ahead. Other creatures had their inherited instincts, their built-in experience. Some, like the beaver or the weaverbird, with their biological tools, could contrive quite elaborate structures; others, like the bees or the ants, could evolve efficient organizations; others, like the squirrel, were provident in the sense of laying in stores. With nimbleness of brain and hand, a combination of gray matter and motor-cells, man could scheme to outreach, with club, or spear or sling, his natural enemies; he could manage nature and escape from the restraints of his environment. He clothed himself in pelts and moved to inhospitable climes, he mastered fire and dared to bring it into his dwelling for heating and cooking, he learned to cultivate and plant the soil, he domesticated animals, and he devised specialized tools like the hoe and the ax to improve the efficiency of his labour.

From earliest time and beginning with the simplest contrivances, every discovery and invention has depended on the fact that the human being is not only a perceptual but also a conceptual creature capable of observing, memorizing, and juxtaposing images. He can make a mental design, a techno-poetic fantasy, even when the means of actually producing it are not available. Seven hundred years ago Roger Bacon could imagine a power-driven ship, a horseless carriage, an airplane, the miniaturized servo-motor, “but one finger in length and one in width,” and the bathysphere. The vision cannot materialize, however, unless man has the method. This is the process by which he makes an observation (perceptual); forms a hypothesis (conceptual); experiments to test this “hunch”; formulates a theory to justify his insights; and by further proofs produces “laws” according to which anyone can go on repeating the results. With spoken language, he can transfer experience, father to son, master to apprentice, generation to generation. With written language, he can produce the textbooks that are the ready-reckoners for other innovators who thereby do not

have to rediscover Newton’s laws or the laws of thermodynamics every few years. This systematic treatment of the arts and crafts is the simplest expression of the meaning of “technology,” from the Greek roots *techne*, arts, and *logia*, words. The ancient Greeks had no such combined term because their philosophers divorced manual skills from intellectual pursuits. Plato berated Eudoxus and Archytas when by experiments and recourse to instruments they solved problems that the theorists considered insoluble. He accused them of “making use of matter which requires manual labour and is the object of servile trades.”

This intellectual condescension still persists, although individual technologists have won recognition from scientific societies and learned academies. The prejudice is suggested by the acceptance of the term “science and technology.” Yet both science and technology use the scientific method. Was Leonardo da Vinci, apart from being an artist, a scientist or a technologist? In terms of discovering and testing new knowledge he was a man of science, but his designs for practical innovations outnumbered those of Thomas Alva Edison. Edison, 400 years later, patented over 1,000 inventions. They included major ones, for which he is remembered, but also hundreds of bits of useful hardware, important in their way. He made only one scientific discovery, the Edison effect, which he patented but did not pursue. The rest were derived from scientific knowledge and developments. He saw the profitable relevancies that lesser men missed; he fitted the mental nut to the mental bolt and created things.

Customarily, science, or the scientific hierarchy, is divided into four categories:

Pure, or academic, research is the pursuit of knowledge for its own sake. It is mainly the work of an individual, or the group he leads. The pure scientist has to justify himself only before a jury of his peers. He is judged not by the usefulness but by the integrity of his work. He is the Maker Possible.

Oriented fundamental research is still basic science; that is to say, the scientist is still questioning nature, seeking to extend knowledge and understanding, but he is not a free agent indulging his curiosity. He is restrained within a frame of reference. For instance, in studying chemical reactions at high pressures he is not assuming that he is going to discover polyethylene, or if he is studying gases at high temperatures he is not necessarily thinking of jet engines or rockets; but he is compiling data that will be important in a general field and likely to have some foreseen applications. In the big corporations, this is called “speculative research.” Such a scientist is likely to have adequate research facilities, endowments, or contracts. He is the Maker Probable.

Applied research is programmed research. The target is specified, and results are expected. The predicted yield is

the measure of the support. The scientist is held accountable in the annual report. He is the Maker to Happen.

Development is really technology, but coupling it with research (R and D) keeps it in the scientific hierarchy and away from the "rude mechanicals." It is the transfer of laboratory results, through the pilot plant, to the production line. R and D is far and away the most expensive scientific bracket because large-scale trial and error ("back to the drawing board") involves multimillions of dollars. The R and D scientist is the Maker to Work.

Through the craft guilds and their "mysteries" and their conversion to factory methods, technology had an evolutionary history in many cultures and many lands. Alfred North Whitehead claimed that "the greatest invention of the nineteenth century was the invention of the method of invention." Nowhere was this better demonstrated than at Edison's "invention factory" at Menlo Park, New Jersey, where, starting in 1876, Edison organized the first industrial research laboratory. In folklore, he is regarded as a "loner," who invented by intuition. In fact, he systematized the process of invention, coordinating and applying relevant knowledge through a hard-worked team that included mathematicians, physicists, chemists, and skilled mechanics. Invention was no longer the private indulgence of the gifted amateur or the rare professional; a techno-methodology had been created to guarantee commercial success. In Edison's case the result was often a "package deal"—not just the incandescent lamp, but the generating plant and the transmission system. In the case of Henry Ford, it was not just the Model T, but the assembly line, which he enlarged to a factory that was one-fifth of a mile long, with a conveyor-belt system that synchronized each stage of construction with the delivery of each part to the operator. He embodied scientific management, with its time-and-motion studies and production engineering.

The feedback system between the know-why (academic science) and the know-how (technology) is recalibrating the time-function of change. A new scientific discovery (explanation of a phenomenon) is seized by the technologists and put to work. In turn the technologists provide the instruments that, with greater refinements and speed, enable the scientists to make further discoveries. An outstanding example is cybernetics. The pencil-and-paper mathematicians had long known the principles of the computer, but they had to wait for the post-World War II electronic engineers to produce the "hardware." Now with instant responses, or nearly so, and vast computer capacities and prodigious "memories," with means not only for numerical calculation but for logical simulation, with feedback (like a burned finger signaling to the brain and the brain withdrawing the finger from the hot plate), scientists are not only able to do calculations so complex that they would not previously have attempted them, but they are also learning, from the engineers, about the nature of systems, including the systems of nature itself. Cybernetics deals with the information-processing aspects, as distinguished from the energy-transforming aspects, of all systems regardless of their physical nature. This has facilitated the development of automatic control, telecommunications, and computing; it is applicable also to systems engineering, economics, and neurophysiology.

Though we acknowledge the truth of Whitehead's apho-

rism, his essentially engineering approach to technology is too restrictive. Every advance in the practical arts from hunting to food-gathering to cultivation, to animal husbandry, to irrigation, to mining, and on through construction, transportation, food-processing, heating, power generation, lighting, communications, military engineering, and clinical medicine has produced social and cultural changes. The Neolithic Revolution was as climacteric as the Industrial Revolution. Moreover, the preoccupation with Western technology ignores the cultural origins of many major innovations and forgets that, historically, the European Dark Ages (not so dark as is often supposed) coincided with Golden Ages of material advances in China, India, and pre-Columbian America. Only in recent years have historians (Singer, Crombie, Lynn White, Hall, Needham, Forbes, and others) given serious attention to these facts. The anthropologists, looking at cultural influences, have been similarly remiss. Economists have been preoccupied with the "production function" and sociologists with the social effects of innovation (from television to freeways) and with work-force redundancy. The present distortions, produced by rapid technological change, obscure the fact that civilization itself derived from excess production and redundancy. When agriculture surpassed subsistence, fewer tillers were required to support the cities, with their artisans (specializing in other forms of production), their priest-hoods, their scholars, their soldiery and warrior-kings, their tithe-gatherers, their merchants, and their money-changers. Technological displacement today, whether it is called unemployment, underemployment, leisure, or nonwork, similarly calls for social readjustments to find nonmanufacturing expressions of human capacities.

No explanation of the intrinsic or historic attributes of technology can convey the love-hate overtones that the term has acquired. In the ogre sense of the word, it has become a threat to lives and livelihoods and to the total environment. In the efficiency sense, it is hailed as the methodological solution of all our problems from government administration to the production of miracle grains to abolish hunger. Some, like Jacques Ellul and B.F. Skinner, claim that we are already the hostages of our man-made environment: the first maintaining that technology has taken over all of man's activities and not just his productive activities; the second, that autonomous man, with free will and freedom and dignity, is now an anachronism and has to be intentionally controlled by the "technology of behaviour."

Obviously this usage is stretching the meaning of "technology" beyond the foregoing derivations and descriptions—the etymology; the cultural origins; the scientific precedents; the nuts-and-bolts and something popularly promoted to capital letters as "The Machine." This usage expands even Harold Lasswell's accommodating version: "The ensemble of practices by which one uses available resources to achieve values." It is more consistent with the French *la technique*, which refers to any complex of standardized means for attaining predetermined ends. Thus it would apply to organization, government institutions, systems of politics or religions, or anything which reduces spontaneous or impulsive behaviour to a rationale. As was said of *la technique* of wartime operational research, "it ran the war by numerical thinking instead of gusts of emotion."

In adventurously exploring the three divisions and fifteen sections of the encyclopaedia's treatment of technology of which this introduction is, hopefully, the appetizer, the reader will find other interpretations and probably produce his own. In common usage, however, the preoccupation is with "The Machine" and the effects of its products on our lives.

Resentment against the replacement of men by machines goes back beyond Ned Ludd and the machine-wreckers of the Industrial Revolution, but present-day attitudes are of a different order of magnitude. They derive from the speed and scale of change. Hahn and Strassmann's laboratory discovery of uranium fission in 1938 was transformed into a nuclear bomb in 1945. If there is no nuclear war, history will consider the Manhattan Project, which produced the bomb, as important as the bomb it produced. It is the archetype of the crash program in which men, materials, and methods are mobilized to attain an objective in a given time. Man on the Moon by 1970 was another example, with the time-target beaten by six months. The time-lapse between a fundamental scientific discovery and its practical application has been reduced from centuries to decades to years to months. Since World War II, we have had the Atomic Age, the Cybernetic Age, the Space Age, and now the Bioengineering Age, in which not only by organ transplants but also by the deliberate manipulation of genes it may be possible to engineer the nature of man himself. Thus in the growing up of the postwar generation

there have been four major epochs nearly as significant as the Stone Age, the Iron Age, the Renaissance, and the Industrial Revolution. At the same time there has come the shocked awareness of the effects on the environment of the wastes of technology. Again this is a matter of scale and lack of prescience. (The ore miners and metal workers of Cyprus and Asia Minor were polluting the Mediterranean with heavy metals 5,000 years ago, but the effects were insignificant compared with volcanic debris.) When people complain, however, of "interference with the environment" they should be mindful that such interference has been the *sine qua non* of the survival of *Homo sapiens*. Moreover, when we try to get rid of our guilt-sense about the effects of misused technology and reject the gadgeting we ashamedly enjoy, we should not go too far and "throw out the baby with the bathwater." We cannot go back to the apes nor even to Arcadia.

The great problem is how to force ebullient technology and its transnational expansion to produce human well-being, not just in the quantity of artifacts but in improving the quality of life, including redressing of the mischief in the environment. This requires an enlightened and informed society that knows what it wants and is not cult-ridden or crash-programmed into accepting what it does not want or need. This cannot be achieved through programmed learning nor the technology of behaviour nor systems engineering. We are back with the know-why as the initiator and the monitor of the know-how.

Part Seven. Technology

Several points should be noted about the relations of this part to other parts. Technology involves applications of the knowledge of nature dealt with in Parts One, Two, and Three and in turn has an influence on the development of that knowledge. It has a major role in relation to human communication and an influence on the cultural, social, economic, political, legal, and educational life of humankind, dealt with in Part Five; and a conditioning effect on the development of the fine arts, dealt with in Part Six. To a degree, technological developments affect developments in the religious life of humans, dealt with in Part Eight. Technology is a major dimension in the history of humankind, the subject of Part Nine.

The branches of technology and of engineering have themselves become the subject of historical and analytical studies. Those studies are presented in Section 10/37 of Part Ten.

Division I. The Nature and Development of Technology 265

II. Elements of Technology 268

III. Major Fields of Technology 280

Division I. The Nature and Development of Technology

The outlines in the two sections of Division I treat the scope and history of technology, and the organization of human work.

Section 711. Technology: Its Scope and History 265

712. The Organization of Human Work 266

Section 711. Technology: Its Scope and History

A. General conceptions or definitions of technology

B. Relations between technology and other spheres of contemporary life

1. Technology and wealth

2. Technology and war
[see 736]

3. Technology and education

4. Technology and art
[see also 612.D.4.]

5. Technology and social institutions
[see also 512.B.3.]

6. Technology and the underdeveloped regions: the export of Western technology
[see also 512.B.3.]

7. Effects of technology on the environment
[see also 355.B.1.]

C. History of technology: sociocultural consequences of technological changes
[see also 512.B.]

1. Technology in the ancient world

a. The beginnings of technology (to c. 3000 BC): emergence of the earliest communities, use of stone tools and weapons, beginnings of mining and agriculture

b. The urban revolution (c. 3000–500 BC): early civilization in the valleys of the Nile and Tigris-Euphrates river systems, waterworks for irrigation, urban manufacturing

c. Technological achievements of Greece and Rome (500 BC–AD 500): mastery of iron, invention of mechanical contrivances, architectural and constructional works

2. Technology from the Middle Ages to 1750
 - a. Medieval advances (AD 500–1500): harnessing of wind power and waterpower; construction of canals and bridges; construction of full-rigged ships; invention of printing
 - b. The emergence of Western technology (1500–1750): invention of early scientific instruments and tools, birth of steam power, development of agricultural and constructional techniques
3. The Industrial Revolution (1750–1900)
 - a. Advances in power technology: development of steam power, internal-combustion engine, and electric power; exploitation of mineral and fossil fuels
 - b. Development of industries: iron and steel, textiles, chemicals, transportation, communications
4. Technology in the 20th century
 - a. Early developments: exploitation of hydroelectric power; synthesizing of fibres, plastics, rubber, dyes, and drugs; rationalization of production
 - b. Space Age technology: nuclear power, automation and the electronic digital computer, rocketry and space exploration, advances in agricultural technology, advances in transportation and communication
 - c. Effects of technology on the environment

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and a biography dealing with technology: its scope and history

Edison
Technology, The History of

MICROPAEDIA: Selected entries of reference information

General subjects

industrial engineering	industrialization manufacturing	safety safety engineering	service industry technology
Industrial Revolution	research and development	security and protection system	

Biographies

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Section 712. The Organization of Human Work

A. The organization of work

1. The organization of work in the prehistoric world
[see also 512.B.1.]
 - a. Origin of division of labour based on age and sex differences, initial absence of class divisions
 - b. Communal organization: specialization required by the development of pottery, textiles, agriculture, and metallurgy
2. The organization of work in the ancient world
 - a. Theories of civilization's development: explanations of the origin of hierarchical organization
 - b. Effect of social classes on the organization of labour
 - c. Organization of agricultural labour
 - d. Organization of industrial labour by craft
 - e. Organization of labour for large-scale construction
3. The organization of work in the medieval world: the manor system, the craft guilds, organization of free labour for large-scale construction

4. Changes in production techniques from the 16th to the 18th century: foundations of modern industrial production
 5. Mass production: the organization of labour by product rather than by process
 6. The use of machines as replacements for labour
- B. The application of scientific methods to managerial functions
1. Operations research: the application of scientific method to the management of organized systems
 2. Systems engineering: the utilization of scientific and technological knowledge in planning and designing complex systems
 3. Systems-design techniques, tools, and procedures
 - a. Techniques: use of flow charts and other symbolic models, precise formulation of suitable objectives
 - b. Tools: optimization theory, communication theory, queuing theory, game theory
[see also 10/23.E. and F.]
 - c. Procedures: exploratory planning, development planning
- C. The relation between man and machine in industrial production
1. The effects on mankind of the rationalization of work: psychological and social aspects of mass production and automation
 2. The human-factors approach: the design of machines, tools, and work environments with consideration for the capabilities and limitations of humans

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the organization of human work

Automation
 Industrial Engineering and Production Management
 Modernization and Industrialization
 Work and Employment

MICROPAEDIA: Selected entries of reference information

General subjects

assembly line	game theory	mathematical	systems engineering
automation	Hawthorne	programming	time-and-motion
critical path	research	operations research	study
analysis	human-factors	queuing theory	trade organization
domestic service	engineering	robot	work
domestic system	mass production	standardization	

Biographies

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Division II. Elements of Technology

[For Part Seven headnote see page 265.]

Division I is concerned with the nature and effects of technology as a whole. The outlines in the five sections of Division II deal with technical processes not specific to any of the major fields of technology. The technologies of the major fields are dealt with in Division III.

Section 721. Technology of Energy Conversion and Utilization 268

722. Technology of Tools and Machines 270

723. Technology of Measurement, Observation, and Control 271

724. Extraction and Conversion of Industrial Raw Materials 274

725. Technology of Industrial Production Processes 277

Section 721. Technology of Energy Conversion and Utilization**A. Major types of energy useful to humankind**

1. Primary energy sources: thermonuclear reaction, nuclear fission, radioactivity
2. Recurring energy sources: solar energy, natural thermal energy, wind and water energy, biomass
3. Nonrenewable energy sources: coal, natural gas, oil

B. Devices and techniques for the utilization of energy

1. Devices for utilizing muscle energy: pulley, lever, block and tackle, treadmill
[see also 722.B.1.]
2. Devices for utilizing wind and water energy: sails and sailboats, windmills, waterwheels, wind and water turbines
3. Devices for utilizing gravitational energy: pendulums, counterweight mechanisms
4. Devices for utilizing strain and compression energy
 - a. Steam engines and steam power plants
 - b. Steam turbines
[see B.2., above]
 - c. Compressed-air and compressed-gas tools and machines
 - d. Hydraulic devices
5. Devices for utilizing magnetic and electrical energy
 - a. Magnets, electromagnets
 - b. Electric motors: induction motors, synchronous motors, commutator motors utilizing alternating current and direct current
6. Devices for utilizing rotational energy: centrifuges, gyroscopes
7. Devices for utilizing heat energy: heat exchangers, refrigeration equipment
8. Devices for utilizing chemical energy
 - a. Internal-combustion engines: gasoline and gas turbine engines; diesel engines; jet, turbojet, fan-jet, and turboprop engines; rocket engines
 - b. Chemical explosives: black powder, nitroglycerin, dynamites, nitrocellulosic explosives, military explosives, other modern high explosives
9. Devices and materials for utilizing nuclear energy: nuclear fission reactors, radioactive isotopes,
nuclear fusion reactors
[see also 112.B., C., F., and G.]
10. Devices for utilizing solar energy

C. Devices for energy conversion

1. Thermoelectric devices
2. Thermionic devices
3. Magnetohydrodynamic power generators
4. Batteries and fuel cells

5. Lamps and other lighting devices
 6. X-ray tubes
[see also 111.D.1.]
 7. Devices for electric power generation: turbine-driven generators, engine-driven generators, nuclear-powered generators, hydraulic-turbine-driven generators, thermoelectric generators, dynamos, photovoltaic devices
- D. Devices for energy concentration and control
1. Electron tubes
 2. Solid-state devices; *e.g.*, transistors, semiconductor diodes, integrated circuits
 3. Optoelectronic devices; *e.g.*, liquid-crystal displays, optical fibres, semiconductor lasers
- E. Devices for unlimited production of free energy: attempts to design perpetual motion machines

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the technology of energy conversion and utilization

Electronics
Energy Conversion

Industries, Chemical Process
Industries, Extraction and Processing

MICROPAEDIA: Selected entries of reference information

General subjects

<i>chemical explosives:</i>	<i>electronic devices:</i>	evaporator	<i>moving-fluid devices:</i>
blasting	amplifier	heat exchanger	centrifugal pump
blasting cap	antenna	heat pipe	hydraulic
dynamite	band-pass filter	refrigeration	transmission
explosive	diode	<i>internal-combustion</i>	pump
firework	electric circuit	<i>engines:</i>	turbine
gunpowder	electric switch	carburetor	waterwheel
nitrocellulose	electron tube	choke	windmill
RDX	electronics	diesel engine	<i>nuclear reactors:</i>
<i>compression energy</i>	ferrite	fuel injection	breeder reactor
<i>and its devices:</i>	grid	gasoline engine	fusion reactor
bellows	ignitron	ignition system	nuclear reactor
cogeneration	integrated circuit	internal-combustion	<i>rockets:</i>
compressor	klystron	engine	Atlas rocket
piston and cylinder	laser	jet engine	Delta
pneumatic device	magnetron	ramjet	launch vehicle
propellant	microprocessor	rotary engine	rocket
steam engine	microwave oven	spark plug	Saturn
<i>electrical devices:</i>	photoelectric cell	supercharger	Thor rocket
battery	photomultiplier	turbojet	V-2 missile
cell	tube	turboprop	<i>other:</i>
electric generator	printed circuit	<i>major types of energy:</i>	blowpipe
electric motor	semiconductor	electric power	magnetohydro-
electrolytic cell	device	energy	dynamic power
electromagnet	transistor	fire	generator
fuel cell	<i>heat exchange and</i>	fossil fuel	perpetual motion
fuse	<i>related devices:</i>	geothermal energy	thermionic power
linear motor	boiler	hydraulic power	converter
magneto	cogeneration	hydroelectric power	thermoelectric
motor generator	condenser	solar energy	device
voltage regulator	cooling system	tidal power	transducer
		waterpower	

Biographies

Braun, Wernher von
Carnot, Sadi
De Forest, Lee
Diesel, Rudolf
Evans, Oliver

Goddard, Robert
Hutchings
Nobel, Alfred
Bernhard

Sperry, Elmer
Ambrose
Stevens, John
Tesla, Nikola

Watt, James
Westinghouse,
George

See also Section 10/37 of Part Ten

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Section 722. Technology of Tools and Machines

A. Hand tools

1. Early history of hand tools: Paleolithic and Neolithic stone tools, development of metal tools
2. Basic types of hand tools
 - a. Percussive tools: hammers, axes
 - b. Cutting, drilling, and abrading tools: knives, saws, files
 - c. Screw-based tools: screwdrivers, wrenches
 - d. Measuring and defining tools: levels, dividers, rules
 - e. Tool auxiliaries: workbench, vise
3. Power-driven hand tools: electric drills and circular saws, pneumatic hammers and riveters

B. Machines and machine components

1. Simple machines: lever, wedge, wheel and axle, pulley, and screw
2. Machine mechanisms: devices that transmit motion by means of flexible connectors, rigid connecting links, or direct contact
3. Machine components
 - a. Gears
 - b. Cams
 - c. Linkages
 - d. Flywheels
 - e. Belt and chain drives
 - f. Couplings
 - g. Clutches
 - h. Brakes
 - i. Bearings
 - j. Shafts and shaft accessories
 - k. Screws
 - l. Springs
4. Friction accommodation and reduction
 - a. Bearings
[see B.3.i., above]
 - b. Lubricants and their functions, types, and properties

C. Machine tools: stationary power-driven machines for shaping and forming parts made of metal or other materials

1. History and characteristics of machine tools
2. Operation of metal-cutting tools
3. Basic machine tools: turning machines, shapers and planers, drilling machines, milling machines, grinding machines, power saws, and presses

4. Modifications of basic machines; *e.g.*, turret lathes, production millers
 5. Special-purpose machines; *e.g.*, gear-cutting machines, broaching machines
- D. Computer-aided machining
1. Computer numerical control
 2. Computer-aided design and computer-aided manufacturing (CAD/CAM)
 3. Robots
 4. Computer-integrated manufacturing
- E. Nonconventional methods of machining
1. Electrical methods: electron-beam machining, electrical-discharge machining, electrochemical machining, ion beam machining, laser machining, plasma arc machining
 2. Other methods: ultrasonic machining, chemical machining, photochemical machining, water-jet machining

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major article dealing with the technology of tools and machines

Tools

MICROPAEDIA: Selected entries of reference information

General subjects

<i>basic machine tools:</i>	router	flexible shaft	transmission
auger	saw	flywheel	washer
boring machine	screwdriver	gear	<i>simple machines:</i>
drill press	vise	governor	capstan
grinding machine	wrench	linkage	crank
lathe	<i>machine components:</i>	machine	inclined plane
milling machine	air brake	mandrel	lever
planer	air spring	mechanism	pulley
punch press	automatic	nut	wheel
reamer	transmission	pin fastener	wheel and axle
router	ball bearing	rack and pinion	<i>other:</i>
shaper	bearing	ratchet	block and tackle
<i>hand tools:</i>	belt drive	Rolamite	divider
adz	bolt	roller bearing	jack
ax	brake	screw	level
brace and bit	cam	shaft coupling	lubrication
chisel	clutch	shaft seal	pantograph
drill	differential gear	slider-crank	square
file	eccentric-and-rod	mechanism	tool
hammer	mechanism	spring	tool and die
pliers	escapement	toggle mechanism	making

Biographies

See Section 10/37 of Part Ten

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Section 723. Technology of Measurement, Observation, and Control

A. Theory of measurement
[see 10/31.B.3.b.]

B. Units and standards of measurement

1. Systems of weights and measures: standards for the measurement of mass and length
2. Standards and techniques for measurement of time

C. Principles and processes by which instruments of measurement operate

D. Common types of measuring instruments

1. Instruments for measuring basic dimensions
 - a. Devices for measuring length: rules, calipers, micrometers
 - b. Devices for measuring mass and weight: scales, balances
 - c. Devices for measuring time: mechanical, electric, and atomic clocks
 - d. Devices for measuring temperature: gas, liquid, and electrical resistance thermometers
 - e. Devices for measuring electric current and other electrical properties: galvanometers, ammeters, voltmeters
 - f. Devices for measuring light intensity: photometers, light meters, exposure meters
2. Instruments for measuring physical properties and relationships derived from basic dimensions
 - a. Instruments for measuring pressure: barometers, manometers
 - b. Instruments for measuring rate of flow: flowmeters, water meters, gas meters
 - c. Instruments for measuring position by angulation and direction finding
 - i. Compasses: magnetic compasses, gyrocompasses
 - ii. Surveying instruments: levels, transits, sextants
 - d. Instruments for measuring gravity: gravimeters
 - e. Instruments for making optical measurements: polarimeters, refractometers
 - f. Instruments for measuring ionizing radiation: Geiger counters, scintillation counters
 - g. Instruments for measuring volumetric and mechanical properties of materials, including density, viscosity, and mechanical strength

E. Instruments used for observing and recording

1. Instruments for observing phenomena
 - a. Microscopes: optical, electron, acoustic, and scanning tunneling microscopes
 - b. Telescopes: optical, radio, and other types (*e.g.*, infrared, ultraviolet, X-ray, and gamma-ray systems)
 - c. Spectroscopes and spectrographs
 - d. Interferometers
2. Instruments for recording phenomena: cameras
[see also 735 G.]

F. Special instruments and apparatus used in scientific research

1. General laboratory equipment: filters, mixers, centrifuges
2. Research reactors
3. Particle accelerators; *e.g.*, Cockcroft-Walton generators, Van de Graaff generators; linear resonance accelerators, betatrons, cyclotrons, synchrotrons, colliding-beam storage rings
4. Mass spectrometers
5. Chromatographs
6. Seismographs
[see also 213.B.6.]
7. Particle detectors: bubble chambers, scintillation counters

G. Major systems of measurement and observation

1. Surveying
[see also D.2.c.ii., above, and 733.A.2.]
2. Mapping and cartography
3. Hydrographic charting
4. Oceanographic measurement
[see also 222.B., E., F., G., and H. and 738.B.]
5. Meteorological measurement
[see also 221 and 223]

6. Astronomical observations
7. Navigational techniques and devices
8. Radiological techniques and devices

H. Instrumentation and control systems

1. Instrumentation systems: systems that operate or actuate control devices or record measurements automatically
2. Control systems
3. Telemetry systems: remote monitoring and control

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with technology of measurement, observation, and control

Analysis and Measurement,	Microscopes
Physical and Chemical	Navigation
Calendar	Particle Accelerators
Climate and Weather	Radar
Mapping and Surveying	Telescopes
Measurement Systems	Time

MICROPAEDIA: Selected entries of reference information

General subjects

<i>astronomical devices:</i>	caliper	<i>instruments and</i>	projection
astrolabe	depth finder	<i>techniques for</i>	surveying
astronomical	gauge	<i>measuring</i>	theodolite
observatory	range finder	<i>properties of liquids:</i>	topographic map
Cassegrain reflector	strain gauge	hydrometer	triangulation
coronagraph	vernier caliper	Jolly balance	trilateration
Keplerian telescope	<i>instruments for</i>	pH meter	weather map
radio	<i>measuring electrical</i>	polarimetry	<i>meteorology:</i>
interferometer	<i>and magnetic</i>	viscometer	anemometer
radio telescope	<i>quantities:</i>	<i>instruments and</i>	barometer
Schmidt telescope	ammeter	<i>techniques for</i>	ceilometer
telescope	bridge	<i>measuring</i>	hygrometer
X-ray telescope	cathode-ray	<i>radiation:</i>	isentropic chart
<i>calendars:</i>	oscilloscope	actinometer	isobar
Aztec calendar	electrometer	bolometer	isotherm
Chinese calendar	galvanometer	cloud chamber	radiosonde
Dionysian period	magnetometer	coincidence	temperature-humidity
Egyptian calendar	ohmmeter	counting	index
French republican	oscillograph	densitometer	weather bureau
calendar	signal generator	dosimeter	wind rose
Greek calendar	voltmeter	frequency meter	World Weather
Gregorian calendar	watt-hour meter	ionization chamber	Watch
international date	<i>instruments for</i>	photometer	<i>navigational</i>
line	<i>measuring force:</i>	radiometer	<i>techniques and</i>
Jewish calendar	balance	solid-state detector	<i>devices:</i>
Julian calendar	gravimeter	spark chamber	celestial navigation
leap year	Roberval balance	wavemeter	compass
lunar calendar	spring balance	<i>mapping and</i>	consol
Mayan calendar	torsion balance	<i>surveying:</i>	dead reckoning
Muslim calendar	<i>instruments for</i>	aerial photography	direction finder
perpetual calendar	<i>measuring motion</i>	cartography	great circle route
Roman republican	<i>and fluid flow:</i>	contour mapping	inertial guidance
calendar	accelerometer	hydrography	system
solar calendar	airspeed indicator	isobar	loran
Tibetan calendar	anemometer	isotherm	loxodrome
<i>instruments for</i>	gas meter	itinerarium	navigation
<i>measuring distance:</i>	speedometer	map	navigation chart
altimeter	tachometer	metes and bounds	portolan chart
	venturi tube	photogrammetry	

radio direction finder	<i>temperature</i> <i>measurement:</i> calorimeter	bushel calibre calorie	pound quart rem
radio range	pyrometer	cord	second
sextant	thermocouple	cubit	sievert
shoran	thermometry	day	stone
solar compass	<i>timekeeping:</i> astrolabe	foot	talent
<i>particle accelerators:</i> betatron	atomic clock	furlong	ton
colliding-beam storage ring	chronometer	gal	volt
cyclotron	clepsydra	gauss	watt
linear accelerator	clock	gill	week
particle accelerator	Coordinated Universal Time	gram	<i>other:</i> acoustic
synchrotron	daylight saving time	gray	interferometer
<i>pressure measurement:</i> barometer	dynamical time	hertz	binocular
pressure gauge	Ephemeris Time	horsepower	control system
<i>radiological dating</i> <i>techniques:</i> carbon-14 dating	longcase clock	inch	dynamometer
fission-track dating	ship's bell	International System of Units	flight recorder
helium dating	sidereal time	kelvin	fluidics
ionium-thorium dating	solar time	kilogram	incubator
lead-210 dating	standard time	league	instrumentation
potassium-argon dating	sundial	light-year	log
protactinium-231- thorium-230	Universal Time	litre	measurement
dating	watch	metre	microscope
protactinium-231- thorium-230	<i>units and standards</i> <i>of measurement:</i> ampere	metric system	optical interferometer
dating	apothecaries' weight	mile	periscope
radiation-damage dating	astronomical unit	mina	photomicrography
rubidium-strontium dating	avoirdupois weight	mole	Richter scale
uranium-thorium- lead dating	barrel	newton	seismograph
	British Imperial System	ohm	servomechanism
		ounce	sound-level meter
		parsec	stroboscope
		pascal	telemetry
		phon	
		pint	
<u>Biographies</u>			
Gilbert, Sir Humphrey	Hakluyt, Richard Henry the Navigator	Lawrence, Ernest Orlando	Lovell, Sir Bernard Mercator, Gerardus

See also Section 10/37 of Part Ten

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Section 724. Extraction and Conversion of Industrial Raw Materials

- A. The world's physical and biological resources
 1. The identification and distribution of natural resources
 2. The management of resources
 - a. Conservation of natural resources
 - b. Salvage operations
- B. Technology of the extraction industries
 1. Mining and quarrying
 - a. Processes: underground mining, surface mining, solution mining
 - b. Products: coal, salt, stone, metal ores, sulfur, phosphates
[see also C.2. and 3., below, and 214.A.4.c. and B.5.a.]
 2. Petroleum and natural gas production
[see also C.1., below, 214.B.5.b. and d., and 732.D.2.]

C. Primary conversion of raw materials

1. Petroleum refining
[see also B.2., above, 214.B.5.b., and 732.D.2.]
2. Coal utilization: production of coke, coal tar, light oil, gas, and chemicals
[see also B.1.b., above, and 214.B.5.a.]
3. Production and processing of metal ores and metals
[see also B.1.b., above, and 214.A.4.c.]
 - a. Aluminum
 - b. Calcium
 - c. Chromium
 - d. Cobalt
 - e. Copper
 - f. Gold
 - g. Iron
 - h. Lead
 - i. Magnesium
 - j. Mercury
 - k. Nickel
 - l. Platinum
 - m. Silver
 - n. Sodium and potassium
 - o. Steel and steel alloys
 - p. Tin
 - q. Titanium
 - r. Tungsten
 - s. Uranium
 - t. Zinc
 - u. Rare-earth metals
 - v. Metal alloys
4. Production of synthetic gemstones and industrial crystals
5. Processing of stone, sand, clay, and gravel
 - a. Manufacture of conventional and special types of glass and glass products
 - b. Manufacture of cement, gypsum plasters, and plastic cements
 - c. Manufacture of industrial ceramics
 - d. Manufacture of bricks and tiles
6. Processing of water to obtain salt, magnesium, oxygen, hydrogen, and other elements
7. Processing of air to obtain oxygen, nitrogen, noble gases, and other gases
8. Processing of plant and animal products
 - a. To obtain paper and pulp
[see also 732.D.3.]
 - b. To obtain roundwood, sawn wood, veneer, plywood and laminated constructions, particleboard, and fibreboard
[see also 732.C.8.]
 - c. To obtain tobacco and other nonfood products
 - d. To obtain leather and hides
[see also 732.C.3.]
 - e. To obtain furs
[see also 732.C.4.]
 - f. To obtain natural fibres
[see also 732.C.1. and 732.D.9.]

- g. To obtain pharmaceuticals
[see also 732.D.4.]
- h. To obtain oils, fats, and waxes
- i. To obtain resins and other products

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the extraction and conversion of industrial raw materials

Conservation of Natural Resources
Forestry and Wood Production
Industrial Ceramics

Industrial Glass
Industries, Extraction and Processing

MICROPAEDIA: Selected entries of reference information

General subjects

<i>alloys:</i>	coke	<i>forest products—</i>	wrought iron
alloy	lignite	<i>other:</i>	zinc
aluminum bronze	<i>forest products—</i>	cork	<i>mineral sources of</i>
amalgam	<i>lumber:</i>	lignin	<i>nonmetals:</i>
babbitt metal	balsa	paper pulp	asbestos
brass	ebony	tannin	barite
bronze	fir	<i>glassmaking:</i>	chrysotile
calamine brass	greenheart	Bakewell glass	feldspar
cupronickel	hardwood	blow molding	fluorite
Duralumin	lancewood	fibreglass	graphite
electrum	logging	flint glass	gypsum
ferroalloy	mahogany	glassblowing	kaolin
misch metal	narra	Jena glass	kimberlite
pewter	oak	mirror	limestone
stainless steel	pine	Orrefors glass	mica
steel	rosewood	Pitkin glass	phosphorite
<i>animal fibres, furs,</i>	seasoning	Pittsburgh glass	pumice
<i>and hides:</i>	spruce	plate glass	quartz
alpaca	teak	Pyrex	shale
camel hair	wood	safety glass	spodumene
cashmere	<i>forest products—oils</i>	silvering	sulfur
fur	<i>and resins:</i>	soda-lime glass	<i>mining and</i>
horsehair	balsam	South Jersey glass	<i>quarrying:</i>
leather	copal	<i>metals of major</i>	Frasch process
mohair	dammar	<i>economic</i>	mining
rabbit hair	dragon's blood	<i>importance:</i>	placer mining
silk	drying oil	aluminum	quarry
wool	gamboge	calcium	stoping
<i>ceramics:</i>	gum	cast iron	surface mining
adobe	lac	chromium	<i>oils, fats, and</i>
brick	mastic	cobalt	<i>waxes—edible:</i>
cement	myrrh	copper	See Section 731
ceramics	naval stores	gold	<i>oils, fats, and</i>
firebrick	pine oil	iron	<i>waxes—inedible:</i>
kiln	resin	lead	castor oil
mullite	rosin	magnesium	Chinese wax
porcelain	tall oil	mercury	drying oil
enamelling	turpentine	nickel	essential oil
portland cement	wood tar	platinum	fat
pottery	<i>forest products—</i>	potassium	fish oil
refractory	<i>rubber:</i>	silver	grease
tile	balata	sodium	lanolin
<i>coal and its</i>	chicle	tin	lavender
<i>processing:</i>	gutta-percha	titanium	linseed
coal	latex	tungsten	oil cake
coal tar	rubber	uranium	oil extraction

oil palm	chromite	naphtha	treated gem
oil plant	cobaltite	natural gas	Verneuil process
perilla oil	cuprite	oil shale	zone melting
pine oil	dolomite	paraffin wax	<i>vegetable fibres:</i>
sperm oil	erythrite	petrochemical	abaca
spermaceti	galena	petroleum	bast fibre
tall oil	halite	reforming	bombax cotton
wax	hematite	salt dome	cantala
whale oil	limestone	tar sand	coir
<i>ore processing:</i>	linnaeite	well logging	cotton
basic oxygen	magnesite	<i>pharmaceuticals from</i>	flax
process	magnetite	<i>plant and animal</i>	hemp
Bessemer process	pitchblende	<i>sources:</i>	henequen
blast furnace	pyrite	alkaloid	jute
crucible process	rutile	Apocynaceae	kapok
cupola furnace	scheelite	belladonna	kenaf
electroplating	sphalerite	Cinchona	leaf fibre
flotation	tetrahedrite	cocaine	Mauritius hemp
hydrometallurgy	uraninite	codeine	milkweed floss
ingot	wolframite	Colchicum	phormium
matte	<i>petroleum recovery,</i>	Ephedra	ramie
metallurgy	<i>refining, and</i>	foxglove	sisal
mineral processing	<i>products:</i>	heroin	sunh
open-hearth	alkylation	insulin	urena
process	asphalt	morphine	<i>other:</i>
parting	bitumen	Strophanthus	kiln
patio process	distillation	Strychnos	man-made fibre
reverberatory	drilling machinery	vitamin A	natural fibre
furnace	gasoline	<i>reclamation and</i>	pitch
smelting	kerosine	<i>salvage:</i>	prospecting
<i>ores of major metals:</i>	liquefied	materials salvage	retting
bauxite	natural gas	scrap metal	tanning
carnallite	liquefied	<i>synthetic gems and</i>	
carnotite	petroleum gas	<i>crystals:</i>	
cassiterite	microcrystalline	assembled gem	
chalcocite	wax	paste	
chalcopyrite	mineral oil	synthetic diamond	

Biographies

See Section 732

INDEX: See entries under all of the terms above

Section 725. Technology of Industrial Production Processes

- A. Materials processing: the operations that are used to transform industrial materials from a raw-material state into finished parts or products
1. Preliminary processing of raw materials
 - a. Mechanical processing; *e.g.*, crushing, mixing, blending, separating, grading
 - b. Chemical processing; *e.g.*, leaching, smelting, coagulation, polymerization
 2. Forming: processes in which parts are produced by casting or molding liquid materials or by applying pressure to solid materials
 - a. Processing liquid materials
 - i. Casting metals; *e.g.*, sand casting, die casting
 - ii. Casting and molding nonmetals; *e.g.*, slip casting, injection molding
 - b. Processing solid materials; *e.g.*, rolling, forging, stamping, pressing
 3. Material removal: processes for shaping parts by removing portions of a solid piece of material

4. Joining: processes for bonding materials to each other
 - a. Thermal joining: welding, brazing, and soldering
[see B.4., below]
 - b. Adhesive bonding: natural and synthetic adhesives and their uses
5. Property modification: alteration or improvement of the properties of materials
 - a. Thermal processing
 - i. Basic heat-treating operations: annealing, stress relieving, and hardening
 - ii. Radio-frequency heating: induction and dielectric heating
 - iii. Zone melting: zone refining and other techniques
 - iv. Exposure to cryogenic temperatures
 - b. Processing of materials by exposure to physical conditions other than heat or cold
 - i. Processing of materials in a vacuum
 - ii. Use of ultrasonic and infrasonic waves
 - iii. Other processes; *e.g.*, exposure to radiation
 - c. Mechanical and chemical processing
6. Finishing processes: modification of the surfaces of materials
 - a. Mechanical and chemical processes; *e.g.*, cleaning, polishing, embossing, coating
 - b. Electrochemical processes: electroplating

B. Metallurgy

1. Mineral processing: crushing and grinding of ores, concentration of metallic minerals
2. Extractive metallurgy: separation of metallic elements from mineral form
 - a. Pyrometallurgy: processes that involve the use of heat
 - i. Roasting: oxidizing, reducing reactions
 - ii. Smelting: processes for removing molten metal from molten slag
 - iii. Converting: techniques for making steel, blister copper
 - iv. Refining: techniques for purifying copper, lead, gold, and other extracted metals
 - b. Electrometallurgy: processes that involve electrochemical reactions
 - i. Electrolytic smelting; *e.g.*, the Hall-Héroult process
 - ii. Electrowinning: techniques for recovering metals from solution
 - iii. Electrorefining: techniques for purifying copper, silver, and other metals
 - c. Hydrometallurgy
 - i. Leaching: techniques for dissolving metallic minerals
 - ii. Recovery techniques; *e.g.*, solvent extraction, chemical precipitation
3. Physical metallurgy
 - a. Cold and hot working; *e.g.*, forging, rolling, drawing
 - b. Foundry processes; *e.g.*, sand casting, die casting
 - c. Surface treatments; *e.g.*, galvanizing, carburizing
 - d. Powder metallurgy: powder manufacture, processes, and products
 - e. Nuclear engineering metallurgy: production, fabrication, and application of uranium and other metals of importance in nuclear engineering
 - f. Heat treatment; *e.g.*, annealing, quenching, tempering
 - g. Metallography
[see also 125.D.1.]
 - h. Inspection and testing: mechanical and nondestructive testing

4. Welding, brazing, and soldering
 - a. Basic principles: the metallurgy of metal joining
 - b. Welding processes; *e.g.*, forge welding, arc welding, resistance welding, brazing, soldering
 - c. Types of joints; *e.g.*, fillet welds, brazed joints
 - d. Weldability of metals
 - e. Testing and inspection of welds: nondestructive and destructive methods
 - f. Applications; *e.g.*, construction of bridges, storage tanks, and ships
 - g. Recent developments; *e.g.*, plasma welding, laser welding, ultrasonic welding
- C. Materials handling in the production process
 1. Types of materials-handling systems by process
 2. Materials-handling equipment; *e.g.*, wheeled carts, power trucks, trailer trains, racks, bins, conveyors
 3. Transportation of materials
[see also 734]
 4. Technology of storage and warehousing
- D. Technology of packaging

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major article dealing with the technology of the industrial production processes

Industries, Extraction and Processing

MICROPAEDIA: Selected entries of reference information

General subjects

<i>adhesives, fasteners, and joining</i>	conveyor	sintering	<i>packaging:</i>
<i>processes:</i>	hose	wire	aerosol container
adhesive	industrial truck	<i>metal treating and</i>	barrel
bolt	materials handling	<i>finishing:</i>	bottle
brazing	pipeline	annealing	drum
cement	stoker	anodizing	packaging
joint	storage	electroless plating	<i>thermal processing:</i>
mortar	<i>metal forming:</i>	electroplating	cryogenics
rivet	anvil	galvanizing	dielectric heating
screw	die-casting	plating	induction heating
soldering	forging	porcelain	radio-frequency
water glass	founding	enamelling	heating
welding	grinding machine	surface hardening	zone melting
<i>materials handling:</i>	investment casting	tempering	
Archimedes screw	mint	terneplate	
containerization	powder metallurgy	tinplate	
	rolling		

Biographies

See Section 732

INDEX: See entries under all of the terms above

Division III. Major Fields of Technology

[For Part Seven headnote see page 265.]

Division I of Part Seven is concerned with the nature and effects of technology as a whole. Division II deals with technical processes not specific to any of the major fields of technology. The outlines in the eight sections of Division III deal with the major fields of technology, differentiated by the various needs, purposes, products, and services that have elicited technological development.

- Section 731. Agriculture and Food Production 280
 - 732. Technology of the Major Industries 283
 - 733. Construction Technology 286
 - 734. Transportation Technology 288
 - 735. Technology of Information Processing and of Communications Systems 290
 - 736. Military Technology 293
 - 737. Technology of the Urban Community 296
 - 738. Technology of Earth and Space Exploration 297

Section 731. Agriculture and Food Production

- A. The history of agriculture
- B. Farm management
 - 1. Basic management problems and practices
 - 2. Farm labour, draft animals, and farm machinery
 - 3. Farm buildings
 - 4. Farming in relation to other disciplines; *e.g.*, weather, pollution control
- C. Crop farming
 - 1. Soil preparation and care
 - 2. Plant propagation, seeding and cultivation
 - 3. Harvesting and crop processing
 - 4. Specialized crop farming techniques: dryland farming, tropical farming, hydroponic farming, greenhouse farming
 - 5. Control of pests and disease organisms
[see also 321.E.2.]
 - 6. Major crops
 - a. Horticultural crops: vegetables and legumes, fruits and nuts, flowers
 - b. Cereals
 - c. Forest crops: trees, rubber
 - d. Production of other major field crops; *e.g.*, coffee, tea, cocoa, sugar, tobacco
- D. Livestock farming
 - 1. Animal breeding
 - 2. Major flock and stock animals
 - a. Cattle
 - b. Swine
 - c. Sheep and goats
 - d. Horses
 - e. Poultry
 - f. Bees
 - g. Other livestock; *e.g.*, buffalo, asses and mules, camels
 - 3. Disease and pest control
- E. Technology of hunting and fishing, whaling

F. Food processing

1. Fruit and vegetable processing
2. Cereals, cereal products, and other starch products
3. Bakery products: basic ingredients, types of products and production methods, market preparation, quality maintenance and testing
4. Confectionery and candy production
5. Meat and meat products
6. Fish and marine products
7. Dairying and dairy products
 - a. Milk production and handling techniques
 - b. Dairy products: fluid and concentrated milk, dried milk, ice cream, butter, and cheese
8. Beverage production
 - a. Technology of brewing
 - b. Technology of wine making
 - c. Technology of producing distilled liquor
 - d. Technology of producing nonalcoholic beverages: soft drinks, coffee, tea
9. Spices, herbs, and flavourings
10. Cane sugar, beet sugar, and other sweeteners
11. Oils, fats, and waxes
12. Eggs and egg products
13. Cocoa and chocolate products

G. Food preservation

1. Methods of preservation
 - a. Low-temperature preservation: refrigeration and freezing
 - b. Preservation by drying and by smoking
 - c. High-temperature preservation: canning and pasteurization
 - d. Fermentation and pickling
 - e. Chemical preservation
 - f. Preservation by heat radiation and by ionizing radiation
2. Food storage and packaging

H. Techniques for controlling the quality of food

1. Evaluation of food quality: sensory evaluation; objective evaluation by chemical, instrumental, and microbiological methods
2. Control of food quality
3. Regulation of food quality by legislation, grading, and inspection

I. Food sources and new product development

1. History and development of new foods and new food products
2. Utilization of new food sources; *e.g.*, oilseeds, leaves, grasses, single-cell protein
3. Development of new market forms
4. Development of special foods; *e.g.*, for space exploration

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with agriculture and food production

Agricultural Sciences	Forestry and Wood Production
Agriculture, The History of	Gardening and Horticulture
Beverage Production	Gastronomy
Farming and Agricultural Technology	Industries, Extraction and Processing
Fishing, Commercial	Public Works
Food Processing	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>beekeeping:</i>	paella	harrow	seafood
beekeeping	pasta	hog house	shellfish
beeswax	polenta	millstone	sponge
honey	tamale	plow	tuna
nectar	<i>cooking:</i>	reaper	whaling
<i>beverages:</i>	baking	scarecrow	<i>food preservation:</i>
absinthe	boiling	silo	canning
alcoholic beverage	braising	thresher	dehydration
aquavit	broiling	tractor	fermentation
beer	cookbook	windrower	food preservation
brandy	frying	<i>farming techniques:</i>	freezing
champagne	leavening agent	chinampa	pasteurization
cider	pressure cooker	contour farming	preservative
coffee	sauce	crop rotation	refrigeration
cognac	shortening	drainage	smoking
distilled liquor	tandoori cookery	dry farming	<i>horticulture:</i>
gin	wok	fertilizer	graft
liqueur	<i>egg and dairy</i>	hacienda	horticulture
maté	<i>products:</i>	hydroponics	pruning
proof	butter	irrigation	transplant
pulque	butterfat	Norfolk	<i>livestock and feeds:</i>
rum	buttermilk	four-course	cattle
sake	candling	system	feed
soft drink	cheese	open-field system	goat
tea	churn	organic farming	hay
tequila	cream	paddy	livestock
vodka	dairying	ranch	pig
whiskey	egg	shifting agriculture	sheep
wine	ice cream	spraying and	silage
<i>cereal crops:</i>	milk	dusting	<i>meat products:</i>
barley	yogurt	tenant farming	aspic
buckwheat	<i>farm equipment and</i>	terrace cultivation	bacon
cereal	<i>buildings:</i>	three-field system	beef
corn	barbed wire	till-less agriculture	frankfurter
millet	barn	<i>fishing and sea</i>	game
oats	cellar	<i>products:</i>	gelatin
popcorn	combine	agar	ham
rice	corn harvester	ambergris	hamburger
rye	cotton gin	aquaculture	lamb
sorghum	cotton harvester	baleen whale	meat
wheat	cream separator	bêche-de-mer	pork
<i>cereal grain products:</i>	crib	caviar	sausage
bran	crop duster	commercial fishing	veal
breakfast cereal	cultivator	factory ship	venison
couscous	farm machinery	fishery	<i>oils, fats, and</i>
dumpling	fence	lobster pot	<i>waxes—edible:</i>
hominy	grain drill	net	babassu palm
noodle	grain elevator	roe	beeswax
			butter

butterfat	oil plant	sugarcane	food processing
cocoa butter	perilla oil	sweetener	food processor
cod-liver oil	sperm oil	<i>tobacco:</i>	forestry
cohune oil	spermaceti	chewing tobacco	fowl
copra	wax	cigar	fruit
corn oil	whale oil	cigarette	pectin
cottonseed	<i>oils, fats, and</i>	pipe	sago
fat	<i>waxes—inedible:</i>	smoking	spice and herb
fish oil	See Section 724	snuff	straw
linseed	<i>sugars:</i>	tobacco	tapioca
margarine	honey	<i>other:</i>	tree ear
oil	maple syrup	additive	vegetable
oil cake	molasses	arrowroot	vinegar
oil extraction	sugar	emulsifier	
oil palm	sugar beet	food colouring	

Biographies

Burbank, Luther
Carver, George Washington

McCormick, Cyrus Hall

See also Section 10/34 of Part Ten

INDEX: See entries under all of the terms above

Section 732. Technology of the Major Industries

A. Principles of organization of work and production
[see 712]

B. Major manufacturing industries

1. The aerospace industry
2. The automotive industry
3. The clothing and footwear industry
4. The furniture industry

C. The major fabrication industries

1. The textile industry
2. The steel industry
[see also 725.B.]
3. The leather and hide industry
4. The fur industry
5. The floor-covering industry
6. The electronics industry
7. The tool and die industry
8. The lumber industry
9. The cutlery industry
10. The abrasives industry

D. The major processing industries

1. The chemical industry
2. The petroleum industry
[see also 724.B.2.]
3. The paper industry
4. The pharmaceuticals industry
[see also 10/35.C.4.]
5. The plastics industry

6. The rubber industry
 7. The surface-coating industry
 8. The dye and pigment industry
[see also 122.G.1.t.]
 9. The man-made fibre industry
 10. Production of industrial and residential gases
[see also 724.C.7.]
 11. The cosmetics and personal care industry
- E. The construction industries
[see 733]
- F. The service industries
1. Hotels and motels
 2. Restaurants
 3. Food service systems
 4. The transportation industry
[see 734]
 5. Security and protection systems
- G. The utilities industries
- H. The merchandising and marketing of consumer goods
[see 533.H.5.]
- I. Industrial research and development
- J. Technology of industrial safety

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and a biography dealing with the technology of the major industries

Dress and Adornment	Industries, Chemical Process
Ford, Henry	Industries, Extraction and Processing
Forestry and Wood Production	Industries, Manufacturing
Industrial Ceramics	Industries, Textile
Industrial Glass	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>abrasives:</i>	blimp	turbojet	<i>chemical processing:</i>
abrasive	Delta	turboprop	ammonia-soda
corundum	flight simulator	V-1 missile	process
emery	fuselage	V-2 missile	autoclave
silicon carbide	glider	wind tunnel	contact process
synthetic diamond	helicopter	zeppelin	detergent
<i>aerospace:</i>	instrument landing	<i>automotive:</i>	drug
air-cushion	system	automobile	dye
machine	jet engine	bus	fertilizer
airframe	launch vehicle	diesel engine	Haber-Bosch
airplane	monoplane	electric automobile	process
airport	ramjet	gasoline engine	man-made fibre
airship	rocket	motorcycle	paper
Atlas rocket	Saturn	tire	pigment
autogiro	seaplane	tractor	pitch
automatic pilot	STOL airplane	truck	retort
balloon	supersonic flight	vehicular safety	
biplane	Thor rocket	devices	

- rubber
- soap
- surface-active agent
- clothing and footwear industry:*
 - button
 - fur
 - glove
 - hat
 - hosiery
 - leather
 - needle
 - sewing machine
 - shoe
 - zipper
- cosmetics and personal care:*
 - ambergris
 - attar of roses
 - cologne
 - cosmetic
 - emollient
 - lavender
 - musk
 - myrrh
 - perfume
- cutlery:*
 - cleaver
 - cutlery
 - flatware
 - razor
 - scissors
 - sword
- dyes and pigments:*
 - acid dye
 - anthraquinone
 - anthraquinone dye
 - azo dye
 - carmine
 - catechu
 - cochineal
 - Congo red
 - direct red
 - dye
 - India ink
 - indigo
 - naphthol
 - pigment
 - quercitron bark
 - sulfur dye
 - vat dye
- electronics:*
 - See Section 721
- floor coverings:*
 - See Section 629 of Part Six
- food service and lodging:*
 - café
 - cafeteria
- hotel
- inn
- motel
- public house
- tavern
- youth hostel
- furniture:*
 - bed
 - cabinet
 - chair
 - chest of drawers
 - couch
 - cupboard
 - davenport
 - desk
 - home appliance
 - settee
 - stool
 - table
- gases, industrial and domestic:*
 - argon
 - carbon dioxide
 - carbon monoxide
 - chlorine
 - fluorine
 - helium
 - hydrogen
 - liquefied
 - natural gas
 - liquefied petroleum gas
 - natural gas
 - nitrogen
 - oxygen
 - sulfur dioxide
- industrial safety:*
 - fire prevention and control
 - flash point
 - safety
 - safety engineering
 - sprinkler system
- lumber:*
 - chipboard
 - ebony
 - fibreboard
 - fir
 - greenheart
 - hardwood
 - lancewood
 - mahogany
 - narra
 - oak
 - particleboard
 - pine
 - plywood
 - rosewood
 - softwood
 - spruce
 - teak
 - wood
- man-made fibres and films:*
 - azlon
 - cellophane
 - cellulose acetate
 - metallic fibre
 - modacrylic
 - nylon
 - polyacrylonitrile
 - polyester
 - polyolefin
 - polyurethane
 - rayon
 - spinneret
- papermaking:*
 - Fourdrinier machine
 - kraft process
 - paper
 - paper pulp
 - parchment
 - sulfite process
- petroleum:*
 - See Section 724
- plastics:*
 - Bakelite
 - celluloid
 - foamed plastic
 - Formica
 - Lucite
 - melamine
 - nylon
 - plastic
 - polyacrylonitrile
 - polychlorotri-fluoroethylene
 - polyolefin
 - polystyrene
 - polysulfone
 - polytetrafluoroethylene
 - polyurethane
 - polyvinyl alcohol
 - resin
 - silicone
 - urea-formaldehyde resin
- rubber:*
 - accelerator
 - foam rubber
 - hose
 - tire
 - vulcanization
- security and protection:*
 - barbed wire
 - cipher
 - code
 - cryptology
 - fence
 - key
 - lock
- police
- security and protection systems
- steel:*
 - basic oxygen process
 - Bessemer process
 - blast furnace
 - Cowper stove
 - crucible process
 - cupola furnace
 - ingot
 - open-hearth process
 - ore dressing
 - smelting
 - stainless steel
 - steel
- surface coatings:*
 - black varnish
 - Brunswick black
 - drying oil
 - Formica
 - paint
 - porcelain
 - enamelling
 - shellac
 - varnish
- textile industry:*
 - batik
 - bleach
 - braiding
 - dye
 - felting
 - knitting
 - loom
 - mercerization
 - plain weave
 - resist printing
 - sizing
 - spinning
 - spinning wheel
 - textile
 - twisting
 - weaving
 - yarn
- textiles:*
 - bombazine
 - calico
 - cambric
 - canvas
 - cheviot
 - corduroy
 - crash
 - crepe
 - crepe de Chine
 - damask
 - duck
 - flannel
 - fustian

gabardine	pile	<i>transportation:</i>	postal system
gauze	taffeta	See Section 734	public enterprise
gingham	tweed	<i>utilities:</i>	public utility
khaki	<i>tool and die industry:</i>	broadcasting	regulatory agency
muslin	See Section 722	electric power	
Biographies			
Bagehot, Walter	du Pont family	Nuffield, William	Siemens,
Beach, Alfred Ely	Ford, Henry	Richard Morris,	Werner von
Bessemer, Sir	Guggenheim, Meyer	Viscount	Siemens, Sir
Henry	and Daniel	Pew, J. Howard;	William
Carnegie, Andrew	Hughes, Howard	and Pew, Joseph	Squibb, E.R.
Drake, Edwin	Hunt, H.L.	N., Jr.	Thyssen family
Laurentine	Kelly, William	Rockefeller, John D.	Yerkes, Charles
		Schwab, Charles M.	Tyson

INDEX: See entries under all of the terms above

Section 733. Construction Technology

A. General building construction

1. Preconstruction planning: design programming, drafting
2. Surveying procedures: techniques for laying out building foundations
[see also 723.D.2.c.ii.]
3. Building materials
 - a. Earth, clay, and sod
 - b. Vegetable matter: thatch, reeds, and other materials
 - c. Lumber
 - d. Bricks and tiles: other fired clay and ceramics
[see 724.C.5.d.]
 - e. Stone
 - f. Mortar, cement, portland cement, and plaster
[see 724.C.5.b.]
 - g. Metals; *e.g.*, iron, steel, aluminum, copper
[see 724.C.3.]
 - h. Glass
[see 724.C.5.a.]
 - i. Concrete, reinforced concrete, and prestressed concrete
 - j. Composition materials, plastics
 - k. Structural fabrics
4. Testing of building materials
5. Construction machinery
 - a. Transport machinery
 - b. Lifting machinery; *e.g.*, cranes, cables, ropes
6. Construction techniques
 - a. Wood and timber construction
 - b. Masonry construction
 - c. Concrete construction
 - d. Steel construction
7. Building components
 - a. Foundations and footings
 - b. Structural systems
 - c. Floor systems

- d. Roof systems
- e. Space-enclosure systems
- f. Interior finishes: *e.g.*, carpeting, hardware, ceiling systems
- g. Auxiliary systems
 - i. Plumbing systems
 - ii. Heating, ventilating, and air-conditioning systems
 - iii. Electrical wiring
 - iv. Systems for illumination: interior and exterior lighting
 - v. Vertical transport systems; *e.g.*, elevators, moving stairways
 - vi. Life-safety systems
- 8. Acoustics and sound-control techniques
- B. Construction of civil engineering works
 - 1. Dams
 - 2. Aqueducts
 - 3. Bridges
 - 4. Underground construction
 - 5. Harbour and hydraulic works
 - 6. Lighthouses and lightships
- C. Prefabrication and shop fabrication

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with construction technology

Analysis and Measurement, Physical and Chemical
 Building Construction
 Drafting
 Public Works

MICROPAEDIA: Selected entries of reference information

General subjects

<i>bridges:</i>	scaffold	putty	fan
bridge	skyscraper	rammed earth	fireplace
covered bridge	truss	shingle	furnace
military bridge	wall	shotcrete	heat pump
movable bridge	wattle and daub	tile	heating
pontoon bridge	<i>building foundations:</i>	wallboard	hypocaust
suspension	cofferdam	<i>construction</i>	stove
bridge	pier	<i>machinery:</i>	ventilating
viaduct	retaining wall	bulldozer	<i>lighting devices:</i>
<i>building construction:</i>	settling	crane	arc lamp
beam	shoring	dredge	Argand burner
box frame	soil mechanics	drilling machinery	candle
construction	<i>building materials:</i>	power shovel	electric discharge
cantilever	aggregate	<i>engineering graphics:</i>	lamp
carpentry	brick	blueprinting	flare
ceiling	cement	drafting	flash lamp
Chicago School	clapboard	isometric drawing	fluorescent lamp
drywall	concrete	<i>heating, ventilating,</i>	incandescent lamp
construction	lath	<i>and air-conditioning</i>	kerosine lamp
framed building	mortar	<i>systems:</i>	lamp
half-timber work	nail	air-conditioning	lantern
hypostyle hall	paris, plaster of	chimney	rushlight
log cabin	portland cement	chimneypiece	safety lamp
post-and-lintel	pozzolana	electric heater	
system			

searchlight	<i>roof types:</i>	tunnel	escalator
spotlight	dome	tunneling shield	gate
<i>masonry construction:</i>	geodesic dome	<i>other:</i>	hippodrome
arch	hip roof	acoustics	jetty
cyclopean masonry	roof	aqueduct	levee
masonry	vault	construction	plumbing
mortar	<i>tunneling:</i>	dam	porch
pointing	air lock	dock	prefabrication
reticulated work	caisson	drydock	stadium
rubble masonry		elevator	

Biographies

Brunel, Sir Marc Isambard
 Eads, James Buchanan
 Fuller, R. Buckminster

Nervi, Pier Luigi
 Roebling, John Augustus
 Roebling, Washington Augustus

See also Section 10/37 of Part Ten

INDEX: See entries under all of the terms above

Section 734. Transportation Technology**A. History of transportation**

1. Primitive transportation; *e.g.*, travois, slide car, sledge, pack animal, dugout
2. The wheel and the road: development of the vehicle wheel, roads of the ancient world, beginnings of the modern road
3. Sails and oars: beginnings of shipping and shipbuilding, growth of inland waterways
4. Steam transportation
 - a. The railroad: the first locomotives, the spread of railways, the construction of railroad bridges and tunnels
 - b. Steam navigation: the first steamships, introduction of iron ships, decline of sailing fleets
5. Development of modern transportation
 - a. Construction of road vehicles, roads, bridges, and tunnels
 - b. Development of mass urban transport and traffic networks
 - c. Development of the air transport industry

B. Roads and highways and their construction**C. Vehicles and devices for transportation across country and on roads and highways**

1. Nonwheeled transportation devices; *e.g.*, bridles, saddles, harnesses, stirrups
2. Animal-drawn wheeled vehicles: wagons, coaches, and carriages
3. Bicycles
4. Automobiles
5. Trucks and buses

D. Rail transportation**E. Stationary conveyance systems; *e.g.*, pipelines, conveyor belts**
[see 725.C.2.]**F. Water transportation**

1. Types of ships and other waterborne vessels
2. Ship design and construction
 - a. Ship design: hydrodynamic and hydrostatic factors that influence ship stability and maneuverability, structural strength and safety considerations
 - b. Shipbuilding, shipyard layout and construction; planning, fabrication, and assembly; launching, outfitting, and trials

- c. Power units for propulsion: steam generators, internal-combustion engines, gas turbines, and nuclear reactors
- 3. Canals and inland waterways
- 4. Harbour works: docks and quays, bulk terminals
[see 733.B.5.]
- G. Air transportation
 - 1. Aircraft: configurations, flight characteristics, missions, and special uses
 - a. Lighter-than-air craft: balloons, airships
 - b. Heavier-than-air craft: fixed-wing aircraft, rotary-wing aircraft, experimental and research aircraft
 - c. Air-cushion machines
 - 2. Airports
 - 3. Air transport industry
 - 4. Space travel
[see 738.C.]
 - 5. Aeronautical and space research
- H. Traffic control: history, problems associated with traffic, government regulations, conventional and computerized techniques of control

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major article dealing with transportation technology

Transportation

MICROPAEDIA: Selected entries of reference information

General subjects

<i>air transport:</i>	Conestoga wagon	<i>rail transport:</i>	raft
air-cushion	curricule	coach	rigging
machine	gig	freight car	road at sea, rules
airframe	hansom cab	locomotive	of the
airplane	harness	marshalling yard	rowboat
airport	horsecar	railroad	rudder
airship	landau	sleeping car	sail
autogiro	one-horse shay	turbo train	ship
automatic pilot	phaeton	unit train	shipyard
balloon	post chaise	<i>water transport:</i>	square sail
biplane	ricksha	anchor	steamboat
blimp	rockaway	buoy	tanker
glider	saddle	canal	trawler
helicopter	sedan	canoe	tugboat
instrument landing	stage wagon	castle	umiak
system	stagecoach	clipper ship	<i>other:</i>
monoplane	sulky	fog signal	aqueduct
seaplane	troika	gondola	bicycle
STOL airplane	wagon	harbour	containerization
supersonic flight	<i>highway transport:</i>	hydrofoil	elevator
Zeppelin	automobile	jib	escalator
<i>animal-powered</i>	boulevard	kayak	litter
<i>transport:</i>	bus	keel	livery company
brougham	electric automobile	lateen sail	pipeline
buggy	expressway	lifeboat	Roman road
carriage	motorcycle	lighthouse	system
cart	road	lightship	shipping route
chaise	tire	lock	Silk Road
chariot	tractor	longship	tonnage
coach	truck	motorboat	traffic control
Concord coach		ocean liner	transportation
		paddle wheel	velocipede

Biographies

Cooper, Peter
 Ford, Henry
 Fulton, Robert
 Gibbs, William
 Francis
 Langley, Samuel P.
 Lear, William P.
 Lindbergh,
 Charles A.

MacCready, Paul
 Beattie
 Montgolfier,
 Joseph-Michel
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 Jacques-Étienne
 Oberth, Hermann
 Julius

Piccard, Auguste
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Tupolev, Andrey
 Nikolayevich
 Wright, Orville
 and Wilbur

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Section 735. Technology of Information Processing and of Communications Systems

A. Communication and information theory

[see 10/23.F.]

B. Calculating devices: the abacus, tally sticks, mechanical and electromechanical calculators

[see C.2., below]

C. Office machines

1. Writing and reproducing machines: typewriters, dictating and transcribing machines, word processors, duplicating machines and processes, copying machines and processes
2. Calculating and accounting machines
3. Miscellaneous office machines

D. Computers

[see also 10/23.A.6. and 7.]

1. Types of computers: analogue and digital computers, hybrid computer systems
2. Programming systems: the encoding and entering of instructions into computer memory, the concept of software, the systems approach to writing computer programs
3. Computer languages
4. Applications of microcomputers, minicomputers, and supercomputers
5. Developments in artificial intelligence: devising expert systems; natural-language processing; computer vision; robotics

E. General information-recording devices

1. Simple recording implements and devices; *e.g.*, writing implements, slates, chalkboards
2. Typewriters and word processors
3. Printing machines and processes
4. Production of printing plates: engraving and other techniques
 - a. Mechanical techniques: woodcut, mechanical engraving, etching, lithography
 - b. Photomechanical techniques: photoengraving

F. Sound and video recording and reproducing devices

[see also 128.E.]

1. Mechanical systems: phonographs
2. Magnetic systems: audio tape recorders, video tape recorders and players
3. Optical systems: audio and video disk players
4. Auxiliary equipment
5. High-fidelity concepts and systems

G. The technology of photography

1. Still photography

[see also 628.D.]

2. Motion-picture and television photography

[see also 623.A.]

3. Holography: laser photography

[see also 128.B.4.c.]

H. Information processing and systems

1. Elements of information processing

a. Analog and digital forms of information

b. Recording and storage: image scanning and optical character recognition; mass storage via electromagnetic and electro-optical media (*e.g.*, magnetic and digital-audio tape and disk, and optical disk, respectively)

c. Organization and retrieval: indexes and indexing; bibliographic and numeric databases; computerized catalogs in libraries and library networks

d. Display and dissemination: television monitors and interactive computer terminals; electronic mail, bulletins, and teleconferencing; electronic printing and photocomposition; speech synthesis

2. Types of information systems

a. Organizational systems

i. Management-oriented systems (executive, command and control, and decision support)

ii. Administration-oriented systems (financial, personnel, and project management)

iii. Service-oriented systems (manufacturing, transaction processing, and expert)

b. Public information utilities (on-line database search systems)

c. Educational and reference systems

i. Dictionaries and lexicons

ii. Encyclopaedias

iii. Atlases and map collections

I. Major systems of communication

1. Book, newspaper, and magazine publishing

2. Postal systems and equipment

3. Telegraph systems and equipment

4. Telephone and telecommunications systems and equipment

5. Radio communications systems and equipment

6. Television communications systems and equipment

7. Communications satellite systems and equipment

8. Electronic networks

9. Encryption and decryption techniques and devices: signal security and message authentication, history of cryptology

J. Major systems of detection and remote sensing

1. Radar systems and equipment

2. Sonar systems and equipment

K. Electronic components and techniques used in communications

1. Components

a. Active components: vacuum and gas-filled tubes, semiconductor devices

b. Passive components: resistors, capacitors, and inductors; other solid-state devices; antennas and waveguides

c. Integrated circuits: miniature arrays of interconnected active or passive circuit elements (*e.g.*, microprocessors)2. Sensing devices and transducers; *e.g.*, piezoelectric devices, photomultiplier tubes

3. Circuitry

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the technology of information processing and of communications systems

Broadcasting	Encyclopaedias and	Libraries	Printing, Typography,
Computer Science	Dictionaries	Motion Pictures	and Photoengraving
Computers	Information	Photography	Publishing
Cryptology	Processing and	Postal Systems	Telecommunications
Electronics	Information Systems		Systems

MICROPAEDIA: Selected entries of reference information

General subjects

<i>computers:</i>	shortwave radio	<i>photography and</i>	incunabula
abacus	superheterodyne	<i>cameras:</i>	ink
analog computer	reception	animation	intaglio
artificial	telecommunications	camera	letterpress printing
intelligence	system	camera lucida	Linotype
computer	telegraph	camera obscura	lithography
computer-aided	telephone	CinemaScope	mezzotint
engineering	teleprinter	Cinématographe	Monotype
computer-assisted	television	Cinerama	offset printing
instruction	Telex	collotype	photocomposition
computer program	Telstar	dye-transfer process	photoengraving
computer	UHF	electrophotography	printing
programming	undersea cable	enlarger	proofreading
languages	VHF	exposure meter	rotary press
computer science	video tape recorder	filter	rotogravure
differential	videocassette	fluorescence	printing
analyzer	recorder	photography	typesetting
differentiator	videodisc	holography	machine
digital computer	videophone	Kinotoscope	<i>publishing:</i>
harmonic analyzer	waveguide	microform	book
input/output	<i>libraries and their</i>	minicam	codex
device	<i>organization:</i>	motion picture	colophon
integrator	archives	motion-picture	gazette
microcomputer	Bliss Classification	camera	journalism
microprocessor	bookmobile	negative	little magazine
supercomputer	Colon	photography	news agency
time-sharing	Classification	shutter	newsletter
word processing	Dewey Decimal	speed	newspaper
<i>electronic</i>	Classification	Technicolor	newspaper syndicate
<i>communication</i>	library	viewfinder	pamphlet
<i>systems and devices:</i>	classification	wet collodion	publishing
amateur radio	Library of	process	royalty
broadcasting	Congress	<i>postal systems:</i>	yellow journalism
cable television	Classification	airmail	<i>sound recording and</i>
citizen's band	library science	Penny Post	<i>sound devices:</i>
radio	Universal Decimal	postal system	cassette
Comsat	Classification	Thurn and Taxis	compact disc
Echo	<i>office machines:</i>	postal system	digital sound
facsimile	accounting	ZIP Code	recording
transmission	machine	<i>printing and printing</i>	flutter and wow
Intelsat	calculator	<i>materials:</i>	loudspeaker
loading	cash register	burin	magnetic recording
minicam	dictating machine	colour printing	microphone
modem	duplicating	computerized	phonograph
modulation	machine	typesetting	sound recording
Morse Code	hectograph	embossing	sound track
multiplexing	mimeograph	engraving	stereophonic sound
radio	photocopying	etching	system
satellite	machine	flatbed press	<i>other:</i>
communication	typewriter	gravure printing	database

dictionary
encyclopaedia
eraser

information
processing
information
science

pen
pencil
public-address
system

qalam
quill
stylus

Biographies

Alembert, Jean Le
Rond d'
Armstrong,
Edwin H.
Beaverbrook, Sir
Maxwell Aitken,
1st Baron
Bell, Alexander
Graham
Benton, William
Burnham, Edward
Levy-Lawson, 1st
Baron
Caxton, William
Cotta family
Cowles family
Dana, Charles A.
Diderot, Denis
Dimbleby, Richard
Disney, Walt
Ferrié,
Gustave-Auguste

Fessenden,
Reginald Aubrey
Girardin, Émile de
Gollancz, Sir
Victor
Greeley, Horace
Gutenberg,
Johannes
Haley, Sir William
Harper brothers
Hearst, William
Randolph
Josephson,
Brian D.
Knopf, Alfred A.
Land, Edwin
Herbert
Lippmann, Walter
Luce, Henry R.
Lumière, Auguste
and Louis

Macmillan, Daniel;
and Macmillan,
Alexander
Manutius, Aldus,
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Marconi,
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Morse, Samuel F.B.
Murdoch, Rupert
Muybridge,
Eadweard
Nelson, William
Rockhill
Niepce, Nicéphore
Northcliffe, Alfred
Charles William
Harmsworth,
Viscount
Ochs, Adolph
Simon
Page, Walter Hines
Paley, William S.

Pearson, Drew
Popov, Aleksandr
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Sarnoff, David
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William
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Thomas, Lowell
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Beauvais
Wallace, DeWitt
and Lila Bell
Acheson
Webster, Noah
Winchell, Walter
Zworykin,
Vladimir Kosma

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Section 736. Military Technology

A. Offensive weaponry

1. Early hand-powered weapons

- a. Construction materials: wood, stone, precious metals, copper, bronze, iron
- b. Shock weapons: *e.g.*, mace, axe, sword, halberd
- c. Missile weapons: *e.g.*, spear, javelin, sling, arrow
- d. Mechanical weapons: *e.g.*, ballista, catapult, ram, crossbow

2. Gunpowder weapons

- a. Construction materials: cast bronze, cast or wrought iron, forged or stamped steel
- b. Loading: muzzle-, breech-, automatic
- c. Artillery: *e.g.*, cannon, howitzer, mortar
- d. Small arms: *e.g.*, musket, rifle, pistol, machine gun
- e. Ammunition

- i. Propellant: black powder, smokeless powder
- ii. Projectiles: *e.g.*, cannonball, shrapnel, shell, bullet

3. Explosives: *e.g.*, grenades, mines, depth charges, bombs, missile warheads

4. Self-propelled missiles

- a. Basing
 - i. Land: *e.g.*, barrage rocket, ballistic missile, surface-to-air missile
 - ii. Sea: *e.g.*, torpedo, submarine-launched ballistic missile, antiship missile
 - iii. Air: *e.g.*, air-to-air missile, cruise missile
- b. Propulsion: rocket, jet, propeller
- c. Guidance: free-flight, energy-sensing, command, inertial

- d. Payloads: *e.g.*, single-warhead, cluster bomblet, multiple reentry vehicle
- e. Warheads: *e.g.*, high-explosive, antipersonnel, nuclear
- 5. Nuclear weapons
 - a. Energy sources: fission, fusion
 - b. Effects: blast, heat, radioactive fallout
- 6. Chemical and biological weapons

B. Defensive weaponry

- 1. Personal protection
 - a. Armour against early hand-powered weapons
 - i. Materials: *e.g.*, leather, bronze, iron
 - ii. Construction: *e.g.*, mail, scale, brigandine, plate
 - iii. Protection: *e.g.*, shield, helmet, cuirass, greave
 - b. Armour against gunpowder and explosive weapons
 - i. Materials: steel, plastic, Kevlar
 - ii. Protection: *e.g.*, helmet, flak jacket, bullet-proof vest
 - c. Protection against nuclear and chemical weapons: *e.g.*, gas mask, overgarments
- 2. Fortification
 - a. Field fortification: *e.g.*, log breastwork, wooden pallisade, trench, foxhole
 - b. Permanent fortification before gunpowder: masonry citadel, motte-and-bailey castle
 - c. Permanent fortification in the early gunpowder era: sunken profile, bastioned trace
 - d. Permanent fortification in the modern gunpowder era: *e.g.*, concrete bunkers, pillboxes, reinforced aircraft hangars
 - e. Antinuclear fortification: *e.g.*, hardened missile silos, bomb shelters
- 3. Missile defense: surface-to-air missiles, rapid-fire guns

C. Weapon platforms

- 1. Land vehicles
 - a. Animal mounts: *e.g.*, horses, elephants, camels
 - b. Man- and animal-powered vehicles: *e.g.*, chariots, siege towers
 - c. Steam power: *e.g.*, railroad cars, early tanks
 - d. Internal combustion: *e.g.*, tanks, armoured personnel carriers
- 2. Surface ships and craft
 - a. Oar-powered: *e.g.*, galleys, longboats
 - b. Sail-powered: *e.g.*, galleons, ships of the line, frigates
 - c. Steam-powered: *e.g.*, battleships, cruisers, aircraft carriers
 - d. Internal combustion: *e.g.*, gunboats, landing craft
 - e. Nuclear-powered: *e.g.*, aircraft carriers, cruisers
- 3. Submarines
 - a. Propulsion: steam turbine, diesel-electric, nuclear
 - b. Vessels: attack, strategic missile launching
- 4. Aircraft
 - a. Fixed-wing airplanes
 - i. Propulsion: internal combustion/propeller, jet
 - ii. Configuration: *e.g.*, biplane, monowing, variable-geometry wing
 - iii. Types: *e.g.*, fighter, bomber, early warning
 - b. Helicopters
 - i. Propulsion: internal combustion, gas turbine
 - ii. Types: *e.g.*, attack, naval antisubmarine, transport

D. Engineering

1. Tactical support: *e.g.*, fortification
2. Strategic support: *e.g.*, roads, bridges, ports, airfields
3. Ancillary support: *e.g.*, maps, bomb disposal

E. Logistics: supply, transport, lodging, services

F. Electronics

1. Electromagnetic sensors and transmitters: the use of radio, radar, infrared, ultraviolet, optical, and laser technology in communication, navigation, warning and detection, and weapon guidance
2. Electronic countermeasures: radar jammers, infrared flares, chaff

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with military technology

War, The Technology of

War, The Theory and Conduct of

MICROPAEDIA: Selected entries of reference information

General subjects

<i>explosives and incendiaries:</i>	B-24	monitor	ram
atomic bomb	B-29	ship of the line	repeating rifle
bomb	B-52	submarine	revolver
depth charge	bomber	U-boat	rifle
grenade	F-4	<i>weapons:</i>	sling
napalm	F-16	AK-47	spear
neutron bomb	F-86	antiaircraft gun	Spencer carbine
nitroglycerin	fighter aircraft	antitank weapon	Springfield rifle
nuclear weapon	Fw 190	Armalite rifle	Sten gun
PETN	Harrier	artillery	submachine gun
shell	Hurricane	assault rifle	sword
smart bomb	Ilyushin Il-2	automatic pistol	Thompson
thermonuclear	Ilyushin Il-76	automatic rifle	submachine gun
bomb	Me 109	battering ram	Uzi
torpedo	MiG	bayonet	submachine gun
<i>launch vehicles and rockets:</i>	Mirage	bazooka	weapon
Atlas rocket	Mosquito	Big Bertha	<i>other:</i>
cruise missile	P-38	bow and arrow	Agent Orange
missile	P-47	Bren machine gun	alcázar
Nike missile	P-51	Browning	ammunition
Peacekeeper	Spitfire	automatic rifle	biological warfare
missile	Stuka	cannon	camouflage
Polaris missile	torpedo plane	carbine	chemical warfare
Poseidon missile	trainer	catapult	flintlock
rocket	Zero	coastal artillery	fortification
Thor rocket	<i>personal protective</i>	crossbow	matchlock
Trident missile	<i>equipment:</i>	dagger	military bridge
V-1 missile	armour	flame thrower	military
V-2 missile	chain mail	Gatling gun	engineering
<i>mechanized ground warfare:</i>	gas mask	Greek fire	sapper
armoured vehicle	helmet	gun	shrapnel
panzer division	<i>warships:</i>	lance	snorkel
tank	aircraft carrier	Lee-Enfield rifle	stealth
<i>military aircraft:</i>	battleship	Luger pistol	Strategic Defense
attack aircraft	cruiser	machine gun	Initiative
AWACS	destroyer	MAG	strategic weapons
B-1	frigate	machine gun	system
B-17	galleon	Mauser rifle	tactical weapons
	galley	MG42	system
	ironclad	musket	
	minesweeper	pistol	

Biographies

Abelson, Philip	Forsyth,	Lake, Simon	Rodman, Thomas
Hauge	Alexander John	Lewis, Isaac	Jackson
Braun,	Fulton, Robert	Newton	Sopwith, Sir
Wernher von	Gatling, Richard	Männlicher,	Thomas Octave
Brialmont,	Jordan	Ferdinand,	Murdoch
Henri-Alexis	Goddard, Robert	Ritter von	Teller, Edward
Browning, John	Hutchings	Maxim, Sir Hiram	Tupolev, Andrey
Moses	Heinkel, Ernst	Maxim, Hudson	Nikolayevich
Bushnell, David	Heinrich	Messerschmitt,	Vauban, Sébastien
Chappe, Claude	Holland, John	Willy	Le Prestre de
Colt, Samuel	Philip	Minié,	Whitehead, Robert
Congreve,	Ilyushin, Sergey	Claude-Étienne	Whittle, Sir Frank
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Drebbel, Cornelis	und Halbach,	Eliphalet	
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Section 737. Technology of the Urban Community

- A. Basic engineering services of the city
 1. Water-supply systems
 2. Sanitation systems
 - a. Development and operation of sewage disposal systems
 - b. Construction and operation of street clearance and refuse disposal systems
 3. Urban transportation systems
 4. Interurban transportation systems
[see 734]
 5. Technology of electric power
[see 721.C.7.]
 6. Fire prevention and control
- B. Technology of the basic social services of the city
 1. Police technology
 - a. Traffic control technology
[see 734.H.]
 - b. Crime control technology
 2. Design, construction, and maintenance of recreational facilities; *e.g.*, parks, stadiums, racetracks, planetariums, aquariums
- C. Technological responses to new urban problems
 1. Control of air, water, land, and other pollution
 2. The planning of cities and urban environments: the systems approach to urban design and construction, the development of new towns

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with technology of the urban community

Conservation of Natural Resources
Police

Public Works
Transportation

MICROPAEDIA: Selected entries of reference information

General subjects

<i>fire prevention and control:</i>	<i>police technology:</i>	pollution	refuse disposal
fire alarm	criminal	smog	system
fire engine	investigation	<i>urban transport:</i>	sedimentation tank
fire escape	electronic	elevated transit	sewage system
fire extinguisher	eavesdropping	line	<i>water-supply systems:</i>
fire fighting	fingerprint	monorail	conduit
fire prevention and control	handcuffs	streetcar	desalination
fireboat	lie detector	subway	qanat
halon	<i>pollution control:</i>	taxicab	reservoir
smoke detector	acid rain	trolleybus	water purification
sprinkler	electrostatic	<i>waste disposal:</i>	water softener
system	precipitation	activated-sludge	water-supply
	emission-control	method	system
	system	incinerator	
	muffler		

Biographies

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Section 738. Technology of Earth and Space Exploration**A. Techniques and equipment of surface and underground exploration****1. Types and purposes of exploration**

- a. Scientific exploration: the determination of the properties of the Earth's interior
- b. Resource exploration: the discovery of sources of ores, building materials, fuels, water, and geothermal energy
- c. Exploration for construction: the planning of tunnels, foundations, and other works

2. Methods of exploration

- a. Indirect methods: geophysical and geochemical methods
- b. Direct methods: on-site testing by means of excavation, boring, and sampling of soil and rock

B. Techniques and equipment of undersea exploration**1. Platforms for exploratory work**

- a. Surface vessels; *e.g.*, deep-sea drilling ships and twin-hull vessels
- b. Submersibles
- c. Aircraft and satellites: application of remote sensing and satellite telemetry
- d. Buoys and other unmanned units; *e.g.*, the Self-Propelled Underwater Research Vehicle (SPURV)

2. Navigational methods and systems for establishing the precise location of discoveries**3. Developments in oceanographic sampling and measurement techniques; *e.g.*, acoustic methods and solid-state microelectronic ocean-current measuring devices****C. Techniques and equipment of space exploration****1. History of space flight prior to Sputnik I: early speculations and fictional accounts, development of space flight theory and technology during the 20th century****2. Space programs since 1957**

- a. Space launch vehicles: rockets designed to provide orbital or escape velocity for manned or unmanned spacecraft
- b. Unmanned space probes
 - i. The use of sounding rockets to explore the upper atmosphere of Earth

- ii. The use of orbiting satellites for scientific purposes; *e.g.*, to study the natural phenomena of space, to test instrumentation and communication techniques
 - iii. The use of unmanned spacecraft to probe the Moon and the planets and their satellites
 - c. Manned space programs: the Mercury, Gemini, Apollo, and Space Shuttle programs of the U.S.; the Vostok, Voskhod, and Soyuz/Salyut programs of the U.S.S.R. and the Russian Federation
 - d. The use of Earth-oriented satellites: communications, Earth survey, and navigation satellites
 - 3. Elements of space flight
 - a. The environment of space: the definition of space, characteristics affecting space flight
 - b. Technology of spacecraft subsystems
 - c. Launch principles and techniques: staging of propulsion systems, acceleration rates
 - d. Mechanics and techniques of space flight
 - i. Types of trajectories: suborbital, Earth orbital, Earth escape, and interplanetary
 - ii. Navigation in space
 - iii. Rendezvous and docking
 - iv. Reentry and recovery
 - 4. Contributions of space exploration to advances in the physical sciences
- D. Techniques of life-support systems for exploration
- 1. Systems used in undersea exploration
 - 2. Systems used in space exploration

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the technology of Earth and space exploration

Exploration

Public Works

MICROPAEDIA: Selected entries of reference information

General subjects

<i>launch vehicles:</i>	Surveyor	<i>unmanned Earth</i>	Vanguard
Delta	Zond	<i>satellites:</i>	Vela
launch vehicle	<i>ocean and seafloor</i>	Aryabhata	<i>other:</i>
Saturn	<i>exploration:</i>	Biosatellite	European Space
<i>man in space:</i>	bathymetry	Cosmos	Agency
Apollo program	bathyscaphe	Discoverer	exploration
astronaut	bathysphere	Earth satellite	Hohmann orbit
Gemini	Challenger	Landsat	interplanetary
life-support system	Expedition	Orbiting	exploration
Mercury	diving bell	Astronomical	National
Mir	Glomar Challenger	Observatory	Aeronautics
Skylab Program	mesoscaphe	Orbiting	and Space
Soyuz	<i>translunar probes:</i>	Geophysical	Administration
space shuttle	Galileo	Observatory	prospecting
space station	Helios	Pegasus	seismic survey
Voskhod	Mariner	satellite	sounding rocket
Vostok	Pioneer	observatory	space exploration
<i>Moon probes:</i>	Venera	Seasat	spacecraft
Apollo program	Viking	Sputnik	unidentified flying
Luna	Voyager	TIROS	object
Moon exploration	Zond	Transit	

Biographies

Armstrong, Neil
 Oberth, Hermann
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Introduction to Part Eight: Religion as Symbolism

by Wilfred Cantwell Smith

There is more to human life than meets the eye. More to oneself; more to one's neighbour; more to the world that surrounds us. There is more to the past out of which we come; and especially, it would seem, more to the present moment, maybe even infinitely more. There is more to the interrelationships that bind us together as persons. And the further we probe, we have always found, the deeper the mystery, or the reward, or the involvement. It is this "more," perhaps, that provides at least one of the bases for human religion. We have seldom been content to be "superficial," to remain on the surface, to imagine that reality does not transcend our finite grasp; and throughout most of our history on this planet we have ordered our lives, both personal and cultural, in terms of that transcendence.

Yet how is one to point to what one does not visually see? How to resort to a milieu beyond all space? How to talk or to think about what transcends not only words but the reach of the mind? How even to feel about what one does not touch? Man's inherent and characteristic capacity to do these things finds expression through his special relation to symbols. These have proven over the centuries sometimes more, sometimes less, adequate to such a task, but in any case indispensable, and ubiquitous. Such symbols, it turns out, have the power not merely to express man's otherwise inchoate awareness of the richness of what lies under the surface, but also to nurture and to communicate and to elicit it. They have an activating as well as a representational quality, and an ability to organize the emotions and the unconscious as well as the conscious mind, so that into them we may pour the deepest range of our humanity and from them derive an enhancement of the personality. Without the use of symbols, including religious symbols, man would be radically less than human.

Quite diverse types of things have served the purpose: a beaver, the sky, a ceremonial procedure, silence; erotic love, or austere asceticism; the Qur'ān; a historical figure; reason. The variety has been immense, different groups having chosen different things to serve them as symbols, not all equally successful. Virtually universal, however, is that peoples have found it possible to designate some item from within the visible world and to sacralize it in such a way that it becomes then for them the symbol or locus of the invisible, the transcendent. In Japan, a simple open gateway (*torii*) marks off the shrine precincts: one passes through it, leaving behind psychologically, symbolically, the humdrum ordinary world to enter the sacred space of the temple; and after worship, one again moves through the gate in the other direction, to reenter now the realm of everyday life, but as a renewed person. Virtually all peoples have set aside some portion of what outsiders would regard as ordinary terrain to serve for them as sacred space, erecting in it temple, church, or shrine whereby is then

represented for them, often with great force, quite another dimension of reality.

Similarly with time: the Jew, for instance, sets apart one day in seven, whereby the other six days symbolize the mundane world with its bitter imperfections, perhaps its devastating pain, and at best its transient successes, while the Sabbath creatively represents the inviolate splendour of transcendence—with which therefore the other six days, however bleak, cannot keep him out of touch. Every people has its festivals, weekly or seasonal or occasional, its sacred times when life in its empirical and work-a-day aspects is transcended and life in its timeless dimension is reaffirmed, reactivated: moments when truth, significance, worth are recognized and cultivated—and carried back then into the ordinary world.

We are somehow aware, if only through imaginative vision or sensibility or our special capacity for hope, not only of what is but also of what ought to be. We have sensed that the *status quo* (nowadays, the *fluxus quo*) is not the final truth about man or the world. We have felt, to take one example, that social justice and concord, personal righteousness, health, joy stand over against the current observable condition of strife, loneliness, wickedness, poverty, and sorrow not as fancy against truth, wishful and irrational dreaming against reality, but in some fashion *vice versa*—as a norm by which the present imperfect world is judged, in some sense a truth in relation to which empirical actuality is in some sense an error. This too has been affirmed symbolically. One rather common way of doing so has been by representing a more perfect world elsewhere. Some have located their utopias chronologically in the past ("Once upon a time"; or Golden Age theories, as in Greece and India); or in the future (millennialisms, a coming just ruler, secular ideas of progress, a life after death); or geographically, somewhere else (the medieval Irish "Isle of the Blessed" in the then inaccessible Western Sea); or high above the sky (heaven, the heaven of heavens); or in a domain beyond time (Paradise); or in another realm than this universe (a metaphysical order, idealist realities).

However it be symbolized and articulated, a moral dimension to human life has been perceived and affirmed. Man has been aware not only of the profitable and the disadvantageous but also of the better and the worse, and has been inspired by some power to pursue the better; he has known that some actions are right, some wrong, and that it matters. At most times and most places, morality has been an integral part of the religious complex (although situations have on occasion arisen when the two have become historically dislocated—when a given form of religion has seemed not good; or to put it another way, when man's sense of what is worthwhile, and the inherited symbols by which worth used to be formulated, have no longer converged).

If the panorama of man's religious life is, in its outward form, selected mundane data symbolizing the more than mundane, then the task of the student of religion is to know those data but to consider them not in themselves but in their role in our lives. Our concern is not primarily the doctrines and scriptures and prayers and rites and institutions; but rather, what these do to us. Not the tribal dance, so much as what happens to the African dancing; not the caste system, so much as what kind of person the Hindu becomes within it, or without it; not the events at Sinai, so much as what role the recounting of these events has played in both Jewish and Christian life over the centuries since; not the Qur'ān, so much as what the Qur'ān means to a Muslim.

In illustration, let us consider as an example a statue of the Buddha, and take note specifically of one small part of it, the pose of the right hand. Among several such stylized poses used throughout the Buddhist world, we may choose just one, the *abhaya mudra* ("fearlessness pose"), in which the right arm is somewhat raised, that hand held straight up, palm facing out. Over and above the more universal significance of such a gesture (power, authority, benediction), in the Buddhist case this represents also an incident from the life of the Buddha, in which reputedly a wild elephant charging him and his group was stopped in its tracks when the Teacher raised his hand so, and became tame. The gesture gives artistic expression, then, to the Buddha's fearlessness in the face of the threat, and also to his conferring of fearlessness, and of grounds for fearlessness, on his disciples: his serene triumph over danger.

To say that this particular feature of sculpture symbolizes for Buddhists the overcoming of fear is to indicate not merely that it depicts an event in someone else's life, but also that it effects a change in one's own—since, to repeat, symbols not only represent but activate. The animal in its fury in the remembered anecdote may itself be taken as symbolic, representative of the pressures and assaults of life, which faith in the Buddha gives one the inner resources to withstand: the passions, for instance, to which such faith bestows on one the power quietly to say "no." To understand this particular item in the religious life of Buddhists, accordingly, is to know the history of how a Japanese emperor or a Thai merchant or a Chinese peasant through contemplating it in some nearby temple has had his life transformed, his fear removed, his personality healed. A parallel may be observed of the role in the lives of Christians, over the centuries, of the story of Christ's stilling of the tempest. His words, "Peace, be still!" read in the Lesson, and the portrayal of the scene in stained-glass windows, have served to symbolize, for people of faith, on the one hand Christ's power over the elements in his own life, and on the other hand the power that their faith in Him has in their lives, they have then found, to confer peace, to quell storms.

A special sort of symbolization, developed characteristically in, for instance, the Western world but by no means only there, has been the conceptual. A few recent philosophers have itched to legislate that concepts must be used to refer only to the sensible or phenomenal world; that it is illegitimate to use them symbolically to refer to a transcendent order. It would be manifestly stultifying to apply so austere a restriction to art or to most other human

pursuits, apart from the natural sciences (from which these persons have learned it). Such an orientation has seemed to work rather well with the "objective" world—better, with the objective facets of the world (at least, until one raises moral questions about atomic bombs or ecology); but it appears stubbornly to misunderstand life in its distinctively human form.

One of the most powerful symbols in human history has, without question, been the concept "God." This concept, like other religious and other human symbols, has demonstrably meant different things to different persons and groups and ages; yet it is hardly too drastic an oversimplification to suggest that the concept has on the whole at least subsumed, integrated, deepened, and made operationally effective in the lives of many hundreds of millions of persons and in the life and social cohesion of many thousands of communities their awareness and their potential awareness of the entire range of transcendence with which they are surrounded or endued—of grandeur, order, meaning, aspiration, awe, hope, virtue, responsibility, rapport, integrity, worth, renewal. The highest, deepest, most comprehensive that they were capable of attaining, individually and socially, was organized, focused, and nurtured in and through this concept. (Given the distinction, observed by all believing theorists, between God and people's ideas of God, such theorists may themselves make this same point by saying that God has used the idea of God to enter people's lives; that the concept has served as a sacrament. More recent developments, with the concept "God" no longer serving so effectively, as a symbol, for many, will be touched on below.)

Although correlative conceptualizations are virtually worldwide and history-long, this particular concept was developed in its most powerful and characteristic form in the Near East and has permeated, at times dominated, the civilizations that have emerged from there to cover almost half the planet, especially the Islāmic and the Judeo-Christian. The Indian counterpart has been in many respects closely similar; in many, subtly different. China and Japan, although also employing symbolic concepts richly, have tended toward other religious and cultural patterns than this particular one.

Even so major a symbol, however, as the concept "God," however all-embracing it may seem, is in the end significant not in isolation but within a whole system of ideas, practices, values, and the like, forming a pattern of which it is no doubt the keystone but not the totality. Certainly minor symbols like the pose of the right hand in a piece of sculpture or medium ones like the ceremonial holiness of the Sabbath, however significant they have been in the lives of many millions of persons, derive their meaning and their power from each being one item within a large pattern of symbolic structures, such as the Buddhist complex or the Christian.

And even these great complexes, each of which has an elaborate and ever-changing history, constitute systems to be understood not in themselves, as structures to be looked at, but rather in terms of the ambience that they make available for men and women to live within. "In order to understand Buddhists, one must look not at something called Buddhism, but at the universe, so far as possible through Buddhist eyes." It is not the symbols themselves

that one must grasp, so much as the orientation that they induce: how the whole complex of symbols enables those who live in terms of it to see a sunset, a broken marriage, prosperity, the onset of cancer, one's election to public office.

The religious history of the Hindu community is a history, in part, of traditional ceremonial and ideological and sociological patterns. Yet in more significant part it is a history, however difficult this may be to discern, of fortitude and of quiet humaneness, of a conviction that life is worth living and death worth dying, that goals are worth striving for, that the immediate is caught up in the eternal. The Buddhist metaphors have served to kindle in the mind and heart of the Buddhist the perhaps unconscious awareness that one's own fortune is not a reason for gloating, or one's neighbour's fortune, for envy; that knowledge is more important than wealth, and wisdom than knowledge; that the world is to be appreciated and not merely exploited; that one's fellow is to be treated as an end, not merely as a means; that sorrow is not a reason for despair. Islāmic law, theology, architecture, and the rest have been symbols that at their best have crystallized and nurtured, for Muslims, the courage and serenity, the sense of order and the aspiration to justice, the forbearance, the humility, the participation in community, that the Islāmic system traditionally inspired. Christian symbols have given both form and actuality, among Christians, to many things, including for instance the ability of human suffering to become redemptive.

Of course, religious symbols and sets of symbols have been used also for mean and destructive purposes. Man's wickedness, and not only his capacity for virtue, has been expressed and even encouraged by his symbol systems, at times. Through them he has found his freedom, his transcendence of the immediately given, his ability to move beyond being merely an organism reacting to its environment; but sometimes he has used these destructively, or has become a victim of their inherent ambiguities. Nothing has turned a society into a community so effectively as religious faith: to share common symbols is about the most powerful of social cohesions. And yet few gulfs have been greater than those that separate differing religious communities, few hostilities so fierce as those between groups whose symbols differ.

Religious symbols do not raise man above the human level; only to it.

A final word about history. The history of religion has at times been mistaken for the history of its symbols; but this is superficial. The same symbols have discernibly changed their meanings over time, and indeed from person to person, and even within one person's life; also,

persisting or widespread orientations and perceptions have been expressed in strikingly different symbolizations. The true history of religion is more deeply personalist—not in the sense of individualist: the personal is also the social, and especially so in the religious realm. The true history of religion, not yet written, is the history of the depth or shallowness, richness or poverty, genuineness or insincerity, splendid wisdom or inane folly, with which men and women and their societies have responded to such symbols as were around them. It is also, however, the tale, and to some degree this can be told, of when and in what fashion they have forged new symbols, or neglected or found themselves unable to respond to old. And nowadays it is also the story of how they deal or fail to deal with a plurality of symbolisms.

One's faith is in some sense the meaning that religious symbols have for one; but more profoundly, it is the meaning that life has, and that the universe has, in the light of those symbols. For religious symbols do not "have" meanings of their own; they crystallize in various ways the meaning of the world, of human life. There is a history of their varying ability to do this, at various times and places (or of people's varying ability to have them do it). How new symbols or patterns of symbols emerge is too complex or controversial a question to be summarized here; but how they develop once launched, how they are reinterpreted (sometimes radically) over the centuries, how their success in pointing beyond themselves often gives way to a rigidity and narrowness in which they or their institutions are prized or defended simply in themselves; how iconoclastic movements arise, to shatter the symbols (literally, smashing idols; or figuratively, attacking concepts and mores), whether in the name of something higher or out of misunderstanding, and often both; saddest of all, how a time may arrive when the symbols no longer serve a community, no longer communicate a transcendent vision, and then a profound malaise settles on the society and life comes to seem without meaning, and people become alienated from each other and even from themselves and from the world in which they live—all this the historian can trace.

In recent Western history an aberrational tendency has arisen to imagine that human life is fundamentally or naturally "secular," and that religion has been an added extra, tacked on here and there to the standardly human. This view now appears to be false. Rather, the various religious systems have expressed varying ways of being human. The unbiased historian cannot but report that it has been characteristic of man to find that life has meaning and to formulate that meaning in symbolic ways, whether grotesque or sublime.

Part Eight. Religion

The outlines in the eleven sections of Part Eight set forth studies of religion in general and studies of the particular religions. The ways in which religion is related to studies of human society, the fine arts, the history of civilizations, and science and philosophy are dealt with in Parts Five, Six, Nine, and Ten.

Division I. Religion in General 303

II. The Particular Religions 306

Division I. Religion in General

The outlines in the two sections of Division I deal with diverse views of the nature, purpose, validity, and value of religion, and with the problems, methods, and results of the empirical, comparative, and phenomenological study of religions and of religious experience.

Section 811. Knowledge and Understanding of Religion 303

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Section 811. Knowledge and Understanding of Religion

- A. The philosophy of religion: diverse views of the nature and characteristics of religion
 - 1. Basic questions and problems
 - a. The existence of the divine or sacred (God)
 - b. The attributes of the divine or sacred
 - c. The extent to which mankind can have knowledge of the divine or sacred
 - d. The special problems of free will, evil and suffering, and immortality
 - 2. Questions about the nature and character of the divine or sacred
 - a. Whether the divine or sacred is personal or impersonal
 - b. Whether the divine or sacred is one or more unique beings or powers
- B. Religious experience: its nature, elements, and varieties
- C. Religious phenomenology: the basic patterns of religious thought, action, and association
- D. Theology as an attempt to understand and state the rationale of religious belief
 - 1. Theology in relation to divine revelation
 - a. The role of Sacred Scriptures
 - b. Doctrine and dogma
 - c. Articles of faith: religious creeds
 - 2. Mystical theology: immediate experience of the divine or sacred
 - 3. Doctrines concerning God or the gods
 - a. Polytheism
 - b. Religious dualism
 - c. Monotheism
 - i. Theism

- ii. Deism
 - iii. Pantheism and panentheism
 - d. Atheism and agnosticism
- 4. Doctrines of creation
- 5. Angelology
- 6. Doctrines of divine government and providence
- 7. Eschatological theories
- 8. Doctrines of grace and salvation
- 9. Sacramental doctrines
- 10. The doctrine of the Covenant
- 11. Miracles
- E. The study and classification of religions
- F. Other systems of belief
 - 1. Myth and mythology
 - 2. Magic
 - 3. Witchcraft
 - 4. Shamanism
 - 5. Astrology and alchemy
 - 6. Ancestor worship
 - 7. Hero worship
 - 8. Nature worship
- G. Religion in relation to other aspects of human experience
 - 1. Religion and art
[see also Part Six]
 - 2. Religion and science
 - 3. Religion and society
[see also 521.D.6.]
 - 4. Religion and morality
[see also 10/52.B.6.]
 - 5. Religion and philosophy
[see also Part Ten, Division V]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the knowledge and understanding of religion

Doctrines and Dogmas, Religious	Religions, The Study and Classification of
Myth and Mythology	Religious and Spiritual Belief, Systems of
Occultism	Sacred Offices and Orders
Philosophies of the Branches of Knowledge	Theology

MICROPAEDIA: Selected entries of reference information

General subjects

<i>basic concerns and phenomena of religion:</i>	heaven	sacrament	<i>conceptions of the divine or sacred:</i>
covenant	hell	sacrifice	agnosticism
creation myth	immortality	salvation	animism
creed	miracle	scripture	anthropomorphism
eschatology	moral theology	sin	atheism
evil, problem of	mysticism	soul	Deism
faith	myth	superstition	deus otiosus
first cause	paradise	theodicy	dualism
free will	prayer	theology	extrinsicism
	prophet	theophany	
	revelation		

fideism High God monotheism	Neo-Paganism pantheism polytheism	religious syncretism	secularism theism
<u>Biographies</u>			
Campbell, Joseph	Frazer, Sir James	Malinowski,	Tiele, Cornelius
Durkheim, Émile	George	Bronisław	Petrus
Eliade, Mircea	James, William	Müller,	Tylor, Sir Edward
Evans-Pritchard, Sir	Jung, Carl (Gustav)	(Friedrich) Max	Burnett
Edward (Evan)	Lang, Andrew	Otto, Rudolf	Wach, Joachim
Frankfort, Henri	Lévi-Strauss, Claude	Söderblom, Nathan	Weber, Max

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Section 812. The Religious Life: Institutions and Practices

A. Religious rites and customs

1. Rituals of worship
 - a. Prayer
 - b. Confession
 - c. Pilgrimage
 - d. Sacrifice
2. Passage and purification rites: birth, puberty, marriage, death
3. Religious regulation of personal and social behaviour
 - a. Religious law
[see 551.B.3.d. and 827.F.6.a.]
 - b. Dietary customs
 - c. Monasticism
 - d. Celibacy
 - e. Asceticism
 - f. Prophecy and divination
4. Religious feasts and festivals

B. Religious leaders and institutions

1. The religious state: theocracies, sacred kingships
2. Forms of religious organization: church, temple, congregation, sect, council; the priesthood
3. Sainthood
4. Institutions of religious education

C. Material manifestations of religious beliefs

1. Sacred writings
2. Art and architecture, religious symbolism and iconography
3. Ceremonial and religious objects, the sacraments
4. Religious dress and vestments

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the religious life: institutions and practices

Doctrines and Dogmas, Religious
 Religious Experience
 Religious Symbolism and Iconography
 Rites and Ceremonies, Sacred
 Sacred Offices and Orders

MICROPAEDIA: Selected entries of reference information

General subjects

<i>disciplines and practices:</i>	<i>places of worship:</i>	monasticism	cremation
asceticism	altar	priesthood	embalming
celibacy	church	prophet	marriage
fasting	high place	sacred kingship	passage rite
feast	mosque	saint	purification
human sacrifice	synagogue	shaman	<i>other:</i>
meditation	<i>religious offices, orders, and</i>	<i>rites of passage and associated practices:</i>	amen
pilgrimage	<i>personages:</i>	anointment	aniconism
prayer	abbot	Baptism	confession of faith
sacrament	canonization	burial	creed
sacrifice	hagiography	circumcision	idolatry
tonsure	hermit	clitoridectomy	relic
	martyr		scripture

Biographies

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Division II. The Particular Religions

[For Part Eight headnote see page 303.]

The outlines in the nine sections of Division II treat the particular religions of mankind, in different historical eras and world areas.

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2. Inferred prehistoric religious beliefs and practices
 - a. Burial customs and cults of the dead
 - b. Cannibalism
 - c. Sacrifices: human, animal, and other offerings
 - d. Hunting rites and animal cults
 - e. Female fertility deities
 - f. Shamanism, sorcery, and magic
3. Religions attributed to various prehistoric cultural stages and regions

B. Primitive religion

1. The nature and significance of primitive religion

2. Primitive views of reality
 - a. The distinction between the sacred and the profane
 - b. Dynamistic, daemonistic, and theistic views of the sacred: the concept of mana
 - c. Animism: external reality viewed as living presence
 - d. Sacred time and times, sacred space and places, and man's nature, origin, and destiny: primitive cosmogonies, cosmologies, eschatologies
3. The nature and function of myth and symbol in primitive religion: their role in ritual, the iconographic character of primitive art
4. Primitive religious practices and institutions
 - a. Sacrifice, purification, passage rites
 - b. Worship or veneration centred on natural objects or forces
 - c. Totemism: the socioreligious system in which men are intimately related to plants, animals, or other natural phenomena
 - d. Worship of ancestors, kings, and heroes
 - e. The roles of asceticism, shamanism, divination, and spiritualistic practices
5. The primitive religions of the major world areas
 - a. Africa: traditional religions of the indigenous African peoples
 - b. Australia and Oceania: religions of the Pacific Island peoples
 - c. The Americas: religions of the indigenous peoples of North, Central, and South America
[see also 822.I.]
 - d. Asia: aboriginal religions of Asian peoples
 - e. The Arctic: religions of the Eskimo, Aleuts, Sami (Lapps), Chukchi, Yakuts, Nganasan, Nenets, and other Arctic peoples

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with prehistoric religion and primitive religion

Doctrines and Dogmas, Religious
Prehistoric Peoples and Cultures
Sacred Offices and Orders

MICROPAEDIA: Selected entries of reference information

General subjects

amulet	devarāja	moon worship	sun dance
animal worship	Dreaming, the	mother goddess	sun worship
animals, master	Earth Mother	phallicism	taboo
of the	fire walking	rain dance	thunder cult
animism	headhunting	Rice Mother	tjurunga
Blessing Way	hieros gamos	sacred clown	totemism
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cannibalism	mana	shaman	world tree
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dema deity	megalith	Stonehenge	

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 - b. Religious literature and mythology
 - c. Beliefs and doctrines: the Egyptian pantheon
 - d. Major forms of Egyptian religion
 - e. Religious symbolism and iconography
4. Religions of the ancient peoples of Asia Minor
5. Syrian and Palestinian religions
6. Religions in the Arabian Peninsula

B. Religions of the Iranian peoples

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2. Early Indo-Iranian religion: nature-polytheism
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3. Religion of the Scythians, Sarmatians, and Alani
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4. The cult of Ahura Mazdā (Ormazd): its influence on the preaching of Zoroaster and the priestly institutions of the Magi
5. Mithraism
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7. Manichaeism
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2. Greek mythology and other religious literature
3. Religious beliefs and speculation: the Greek pantheon
4. Worship, practices, institutions
5. Religious art and iconography

D. Roman religion

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2. Roman gods, goddesses, numina, and genii and their place in family and civic religion
3. Worship, practices, institutions
4. Religious art: sculpture, metalwork, painting, mosaic

E. Religions of the Hellenistic world

1. Mystery religions
2. Gnosticism
3. Manichaeism
4. Hellenistic religious philosophies: neoplatonism, stoicism, epicureanism
[see also 10/51.A.1.c.]
5. Quasi-scientific and magical cults; *e.g.*, numerology, astrology
6. Judaism
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7. Christianity

[see 827]

F. Religions of the early peoples of eastern and central Europe

1. Scythian religion
2. Religions of the Sarmatians and associated peoples
3. Religion of the pre-Christian Slavic peoples

G. Religions of the ancient Celtic and Germanic peoples

1. Religion of the Celts
2. Religion of the Germanic peoples

H. Religions of the early peoples of northeastern Europe

1. Religion of the Baltic peoples
2. Religion of the Finno-Ugric peoples

I. Religions of pre-Columbian American civilizations

1. Inca religion
2. Mayan religion
3. Aztec religion

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with religions of ancient peoples

Doctrines and Dogmas, Religious	Mystery Religions
European Religions, Ancient	Pre-Columbian Civilizations
Middle Eastern Religions, Ancient	Zoroastrianism and Parsiism

MICROPAEDIA: Selected entries of reference information

General subjects

<i>Anatolian religions:</i>	Laima	Aton	<i>Egyptian worship, practices, and institutions:</i>
Hebat	lauma	Atum	
Kubaba	Mēness	Bastet	
Tarhun	Pērkons	Bes	Book of the Dead
Teshub	Saule	Buto	Canopic jar
<i>Arabian religion (pre-Islāmic):</i>	<i>Celtic religion:</i>	Geb	Egyptian religion
hanif	Belenus	Hapi	Heb-Sed festival
Ilumquh	Brân	Hathor	Hermetic writings
Lāt, al-	Brigit	Horus	mortuary temple
<i>Aztec religion:</i>	Celtic religion	Hu, Sia, and Heh	Opet
Chicomecóatl	Cernunnos	Isis	reanimation rite
Coatlícue	Dôn	Khnum	scarab
Huitzilopochtli	Druid	Ma'at	<i>Finno-Ugric religion:</i>
nagual	Esus	Mont	Finno-Ugric religion
Ometecuhtli	Llyr	Mut	haltia
Quetzalcóatl	Lugus	Nekhbet	Kekri
Tezcatlipoca	Medb	Nun	kobdas
Tlaloc	Ogmios	Nut	lud
Tlazoltéotl	Pwyll	Osiris	maa-alused
Tonatiuh	Sucellus	Ptah	Madderakka
Xipe Totec	Teutates	Re	Manala
Xiuhtecuhtli	Tuatha Dé Danann	Sarapis	noiade
<i>Baltic religion:</i>	<i>Egyptian pantheon:</i>	Sebek	Peko
Baltic religion	Amon	Seth	saivo
Dievs	Anubis	Shu	sampo
gabija	Apis	Taurt	Tapio
Kalvis	Apopis	Thoth	tietäjä

Ved-ava	Amphitryon	Laomedon	Trojan horse
Veraldén-radién	Ananke	Leto	Typhon
voršud	Ancaeus	Leucothea	Uranus
<i>Germanic mythology:</i>	Andromache	Linus	<i>Greek pantheon:</i>
Aurgelmir	Andromeda	Lotus-Eater	Aphrodite
Balder	Antigone	Lycaon	Apollo
Fenrir	Antiope	Marsyas	Ares
Freyja	Arethusa	Medea	Aristaeus
Germanic religion	Argonaut	Medusa	Artemis
and mythology	Ariadne	Meleager	Asclepius
Heimdall	Arion	Memnon	Athena
Hel	Asclepius	Menelaus	Chaos
Idun	Atalanta	Midas	Cronus
Kvasir	Athamas	Minos	Demeter
Loki	Atlas	Minotaur	Dionysus
Midgard	Atreus	Myrmidon	Eros
Mimir	Autolycus	Narcissus	Fury
Norn	Bellerophon	Neoptolemus	Grace
Odin	Briareus	Niobe	Hades
Ragnarök	Britomartis	Nisus	Hebe
Skadi	Busiris	nymph	Hecate
Svadilfari	Cadmus	Odysseus	Helios
Thor	Caeneus	Oedipus	Hephaestus
Tyr	Calchas	Orestes	Hera
Ull	Calliope	Orion	Hermes
Valhalla	centaur	Palamedes	Hestia
Valkyrie	Cephalus	Pandora	Hippolytus
Yggdrasil	Cyclops	Paris	Hora
<i>Gnosticism,</i>	Daedalus	Pegasus	Hygieia
<i>Manichaeism, and</i>	Danaus	Peleus	Muse
<i>related movements:</i>	Daphne	Pelias	Nemesis
aeon	Daphnis	Pelops	Nereus
Archon	demon	Penelope	Nike
Cainite	Dido	Perseus	Pan
Carpocratian	Echo	Phaethon	Persephone
Cathari	Endymion	Philoctetes	Poseidon
Docetism	Eos	phoenix	Priapus
Encratite	Erechtheus	Pirithous	Prometheus
Gnosticism	Erigone	Pleiades	Rhea
Hellenistic	Fama	Polyphemus	Selene
religion	Fate	Priam	Themis
Mandaeanism	Fury	Protesilaus	Tyche
Manichaeism	Galinthias	Proteus	Zeus
Marcionite	Gorgon	Pyramus and	<i>Greek worship,</i>
Mazdakism	Greek mythology	Thisbe	<i>practices, and</i>
Ophite	Hector	Sarpedon	<i>institutions:</i>
Paulician	Hecuba	Satyr and	Anthesteria
<i>Greek mythology</i>	Helen	Silenus	Bacchanalia
<i>and legend:</i>	Helenus	Scylla and	baetylus
Acestes	Heracles	Charybdis	Daphnephoria
Achilles	Hesperides	Semele	Delphi
Actaeon	Hyacinthus	Seven Against	Didyma
Admetus	Hyperborean	Thebes	Dodona
Adonis	Hypnos	Sibyl	Eleusinia
aegis	Idomeneus	Siren	Greek religion
Agamemnon	Ilos	Sisyphus	Heraeum
Aglauros	Io	Tantalus	herm
Ajax	Iphigeneia	Theseus	lectisternium
Alcmaeon	Ixion	Thetis	oracle
Amazon	Jason	Tiresias	Palladium
Amphitrite	Laocoön	Titan	

Panathenaea	Ninsun	Diana	Perun
Pyanopsia	Ninurta	Dioscuri	rusalka
Scirophoria	Shamash	Faunus	Syrian and
Thargelia	Sin	Fides	Palestinian
Thesmophoria	Tammuz	Fortuna	pantheon:
<i>Inca religion:</i>	<i>Mesopotamian</i>	Fury	Anath
Chosen Women	<i>religious literature</i>	Janus	Asherah
huaca	<i>and mythology:</i>	Juno	Astarte
Inti	Adapa	Jupiter	Atargatis
Pachacamac	Enmerkar	Lar	Baal
Viracocha	Eridu Genesis	Liber and Libera	Dagon
<i>Iranian religion</i>	Etana Epic	Libitina	El
(<i>pre-Islāmic</i>):	Gilgamesh	Mars	Kothar
Mithra	Lahmu and	Mercury	Melqart
Mithraism	Lahamu	Minerva	Resheph
Yima	Lament for the	Neptune	Shadrafa
<i>Mayan religion:</i>	Destruction of Ur	Penates	Tanit
Ah Kin	Mesopotamian	Picus	Yamm
Bacab	mythology	Psyche	<i>Zoroastrianism:</i>
Chac	<i>mystery religions:</i>	Quirinus	Ahriman
Cizin	Andania mysteries	Salus	Ahura Mazdā
Dresden Codex	Attis	Saturn	amesha spenta
Itzamná	Cabeiri	Silvanus	Avesta
Madrid Codex	Corybantes	Sol	fravashi
Paris Codex	Eleusinian	Venus	Gabar
Popol Vuh	Mysteries	Vesta	Gahanbar
<i>Mesopotamian</i>	Eumolpus	<i>Roman worship,</i>	Gayōmart
<i>pantheon:</i>	galli	<i>practices, and</i>	haoma
Adad	Great Mother of	<i>institutions:</i>	magus
Anu	the Gods	fetial	Nōrūz
Ashur	hierophant	flamen	Parsi
Bel	Iacchus	genius	Rashnu
Belit	Jupiter Dolichenus	Haruspices	Saoshyans
Damu	mystery religion	lectisternium	Sraosha
Ea	Orpheus	Lupercalia	Verethraghna
Ereshkigal	Taurobolium	Matronalia	Vohu Manah
Ishkur	<i>Roman pantheon:</i>	Parilia	yazata
Ishtar	Aeneas	pontifex	Zoroastrianism
Lamashtu	Ascanius	Roman religion	Zurvanism
Marduk	Asclepius	Salii	
Mesopotamian	Bona Dea	supplicatio	
religion	Cacus and Caca	Vestal Virgin	
Nabu	Camilla	<i>Slavic religion:</i>	
Nergal	Ceres	domovoy	
Ningishzida	Cupid	leshny	
Ninhursag			

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Akhenaton
 Anquetil-Duperron, A(braham)- H(yacinthe)
 Basilides
 Imhotep

Kartēr
 Mani
 Valentinus
 Zoroaster

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Section 823. Hinduism and Other Religions of India

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2. The prehistoric and protohistoric periods, through the 2nd millennium BC: the religions of the indigenous prehistoric peoples and of the Indus Valley civilization
3. The Vedic period (2nd millennium–7th century BC)
 - a. The religion of the *Ṛgveda*
 - b. The religion of the later Vedas and *Brāhmaṇas*
 - c. The religion of the *Upaniṣads*
4. The heterodox period (7th–2nd century BC): challenges to Brahmanism by reformers and ascetic groups
[see also D.1., below, and 824]
5. The early Hindu period (2nd century BC–4th century AD): the rise of the major sects and other developments
6. The Purāṇic period (4th–8th century)
7. The rise of devotional Hinduism (8th–11th century): the Tamil hymnists, the *Bhāgavata-Purāṇa* after Hinduism
8. The age of *bhakti* (11th–19th century)
9. The modern period (19th–20th century)
10. Hinduism today

B. Intellectual, spiritual, and imaginative expressions of Hinduism

[see also C.4., below]

1. Hindu sacred literature
 - a. Primary scriptures regarded as eternal revelations: the Veda
 - b. Post-Vedic Sanskrit literature; *e.g.*, epics, *Purāṇas*, *Tantras*
 - c. Sacred literature in Indian regional languages
2. Hindu mythology: varieties of myths, modes of representation and themes
3. Hindu philosophy: the integral relation of philosophy and religion in Hinduism
4. Hindu mysticism: its general characteristics, varieties, goals, and methods

C. Beliefs, practices, and institutions of Hinduism

1. Common characteristics of Hindu belief
 - a. Views about God or the sacred
 - b. Views about the universe
 - c. Views about mankind
 - i. *Ahiṃsā*, the obligation to respect all living beings
 - ii. The doctrines of *karman*, *saṃsāra*, and transmigration
 - iii. The three *mārgas*: the paths of duties, of knowledge, and of devotion
2. The forms of Hinduism
 - a. Vedism and Brahmanism
 - b. Vaiṣṇavism
 - c. Śaivism
 - d. Tantrism and Shaktism
 - e. Folk Hinduism
 - f. Ethical, social, and nationalist movements in modern Hinduism

3. Rituals, social practices, and institutions
 - a. Sacrifice and worship
 - b. Sacred times and places
 - c. The class hierarchy: the caste system
 - d. Religious orders, holy men, the four stages of life
4. Cultural expressions of Hindu values and ideas
 - a. The traditional religious functions of Indian art: symbols and images
 - i. Types of symbols: *yantras*, *maṇḍalas*, *liṅgas*, *yonis*
 - ii. Icons: their role in expressing theological elements of Hinduism
 - b. The religious expression of particular arts
- D. Other religions of India
 1. Jainism
 - a. History of Jainism
 - i. Early background: traditional accounts of Mahāvīra's predecessors
 - ii. The life, work, and teachings of Vardhamāna Mahāvīra
 - iii. Later developments (6th century BC–20th century AD)
 - b. Myths about Jaina "great souls": Tirthaṅkaras, ascetic and monastic figures, and lesser deities
 - c. Beliefs, practices, and institutions of Jainism
 2. Sikhism
 - a. History of Sikhism
 - i. Islāmic and Hindu background (11th–15th century)
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 - ii. The origin of Sikhism in the life and work of Nānak, first of the ten Gurūs (15th–16th century)
 - iii. The establishment and growth of Sikhism under the nine succeeding Gurūs, the establishment of Sikh militarism (16th–18th century)
 - iv. The condition of Sikhism during the Sikh empire (18th–19th century)
 - v. The condition of Sikhism under British rule (19th–20th century)
 - vi. Sikhism in independent India and Pakistan
 - b. Sikh religious literature
 - c. Beliefs, practices, and institutions of Sikhism
 3. Parsiism: Zoroastrianism in India
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 - a. History of Parsiism
 - b. Sources of beliefs and doctrines in Zoroastrian literature
 - c. Beliefs, practices, and institutions of the Parsis

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with Hinduism and other religions of India

Hinduism
 Indian Philosophy
 Jainism
 Sikhism

MICROPAEDIA: Selected entries of reference information

General subjects

<i>Hinduism—</i>	Matsya	Saura sect	Vaisheshika
<i>caste system:</i>	Meru, Mount	Shaktism	Vedānta
Agarwālā	Murugaṇ	Smārta sect	Viśiṣṭādvaita
Bania	naga	Śrīvaiṣṇava	yama
bhāṭiband	Nandi	Swāmi-Nārāyaṇī	Yoga
Brahman	Narasimha	Tantric Hinduism	<i>Hinduism—ritual</i>
Camār	Naṭarāja	Teṅkalai	<i>and practice:</i>
caste	Paraśurāma	Vaḍakalai	antyeṣṭi
Christian caste	Pārvatī	vairāgin	ārti
Dāsa	Prajāpati	Vaiṣṇavism	aśvamedha
Devadāsī	Rādhā	Vaiṣṇava-	darshan
Dom	rakshasa	Sahajiyā	dikṣā
dvija	Rāma	Vallabhācārya	Dīwālī
gotra	Rāvaṇa	<i>Hinduism—</i>	guru
Islāmic caste	Saptamātṛkā	<i>philosophy and</i>	Holi
jajmānī system	Sarasvatī	<i>doctrine:</i>	Janmāṣṭamī
jāti	Śītā	Advaita	kīrtana
Kshatriya	Śiva	ahankara	Kumbh Mela
kul	Skanda	ānanda	līṅga
Mahar	Sūrya	anumāna	Mahā-śivarātri
Marāṭhā	vāhana	artha	mudra
Nambūdiri	Vāmana	asana	navaratra
Nāyar	Varāha	ashrama	Om
outcaste	Varuṇa	āstika	Poṅgal
panchayat	Vāsudeva	atman	pradakṣiṇa
sabha	Vishnu	avatar	puja
Sudra	yaksha	bhedābheda	Rathayātrā
untouchable	Yama	brahma	saṃskāra
Vaisya	yuga	Cārvāka	soma
varna	<i>Hinduism—forms,</i>	chakra	sraddha
<i>Hinduism—deities</i>	<i>sects, movements,</i>	cow, sanctity	Śrī-Nāthajī
<i>and mythology:</i>	<i>and orders:</i>	of the	suttee
Aditi	Ājīvika	deva	tapas
Agni	Arya Samaj	dharma	tilak
Ardhanārīśvara	Bhāgavata	Dvaita	tīrtha
Balarāma	bhakti	Haṭha Yoga	upanayana
bhut	Brahmo Samaj	indriya	yajña
Brahmā	Caitanya	jnana	<i>Hinduism—</i>
Caṇḍī	movement	karma	<i>sacred and secular</i>
churning of the	daśnāmī sannyāsin	kuṇḍalīnī	<i>literature:</i>
milky ocean	Gāṇapatya	mārga	agama
Dharma-Ṭhākura	Kānpṛaṭa Yogi	maya	Āraṇyakas
Durgā	Kāpālīka and	Mimamsa	Artha-śāstra
Gaṇeśa	Kālāmukha	nirguṇa	Aṣṭchāp
Garuḍa	Kashmir Śaivism	Nyāya	Bhagavadgītā
grāmadevatā	Līṅgāyat	prakṛiti	Bhāgavata-Purāṇa
Hanumān	Nātha	pramāṇa	Brāhmaṇa
Harihara	Pāñcarātra	prana	dharmaśāstra
Indra	Pāśupata	prāṇāyāma	dharmaśūtra
Jagannātha	Prarthana Samaj	pratyakṣa	Gītāgovinda
Kālī	Rādhā Soāmi	purusha	Gr̥hya-sūtra
Kalkin	Satsaṅg	śabda	Kalpa-sūtra
Kāma	sadhu and swami	samadhi	Mahābhārata
Krishna	Śaiva-siddhānta	Samkhyā	maṅgal-kāvya
Kubera	Śaivism	saṃsāra	Manu-smṛti
Kūrma	sampradāya	tat tvam asi	Nāyanār
Lakṣmī	sannyasi	upādhi	Purāṇa
Manasā	Satnāmī sect		
Manu			

Rāmāyaṇa	Bāhubali	Pārśvanātha	gurdwārā
Smṛti	Digambara	Paryuṣaṇa	Gurū
Śrauta-sūtra	dravya	Rṣabhanātha	Harimandir
Śruti	gaccha	Śiddha	Khālsā
sūtra	guṇasthāna	Sthānakavāsī	Nāmdhārī
Tantra	Jaina canon	Śvetāmbara	Nirañkāri
Upanishad	Jaina vrata	syādvāda	Rām Rāiyā
Veda	Jainism	Tirthaṅkara	Sikhism
<i>Jainism:</i>	jiva	<i>Sikhism:</i>	Singh Sabhā
ahimsa	Kālakācāryakathā	Ādi Granth	Udāsī
ajiva	Kalpa-sūtra	Akāl Takht	<i>other:</i>
Ariṣṭanemi	leśyā	Akālī	Parsi
aṣṭamaṅgala	nirjarā	Dasam Granth	Vedic religion
Biographies			
Aurobindo, Śrī	Gobind Singh	Mirā Bāi	Rāmānuja
Caitanya	Keshab	Nānak	Roy, Ram Mohun
Dādū	Chunder Sen	Ram Singh	Śaṅkara
Dayananda	Madhva	Ramakrishna	Tara Singh
Sarasvati	Mahāvīra	Ramana Maharshi	Vivekananda
Fateh Singh, Sant	Meher Baba		

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Section 824. Buddhism

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1. The cultural context: its background in Hinduism; its geographical, ethnic, and cultural base
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2. The founding of Buddhism: the life, work, and teachings of Siddhārtha Gautama (6th–5th century BC)
3. Developments in India (6th century BC–12th century AD)
4. Buddhism in Central Asia and China
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5. Buddhism in Korea and Japan
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6. Buddhism in Tibet and the Himalayan kingdoms
7. Buddhism in Ceylon (Sri Lanka) and Southeast Asia to the mid-19th century
8. Buddhism in the late 19th and 20th centuries

B. Intellectual, spiritual, and imaginative expressions of Buddhism

[see also C.4., below]

1. Buddhist sacred literature
2. Buddhist mythology: basic types, contents, and functions of myths
3. Buddhist philosophy: the role and contribution of systematic reflective thought
4. Buddhist mysticism: universal characteristics; regional and historical variations; goals, techniques, and approaches

C. Beliefs, practices, and institutions of Buddhism

1. Traditional beliefs and doctrines
 - a. Views of the nature of reality; *e.g.*, the impermanence of all existence, the absence of self, the underlying state of suffering and its causes
 - b. The Eightfold Path to salvation or release
 - c. The goal of the Eightfold Path: Nirvāṇa
 - d. The Threefold Refuge—in the Buddha, the doctrine, and the community

- e. Views of the gods, spirits, and demons: the role of miraculous powers
2. The main forms of Buddhism
 - a. The Theravāda school and other ancient schools
 - i. Views of the nature of things: cosmology, the classification of *dharmas*
 - ii. The emphasis on self-cultivation and self-salvation: the stages leading to *arhatship*, the levels of meditation
 - iii. Doctrines concerning Buddha and Buddhahood
 - iv. Characteristics of the individual ancient and transitional schools
 - b. The Mahāyāna version
 - i. Views of the nature of absolute reality: the ultimate realization of the meditative quest
 - ii. Views of the transcendence of the Buddha: the three aspects of the Buddha, the *bodhisattva* ideal
 - iii. Characteristics of the individual Mahāyāna schools; *e.g.*, Mādhyamika, Yogācāra, Avatamsaka, Zen, devotional schools
 - c. Esoteric Buddhism: Tantrism, Tibetan Buddhism, Shingon
3. Practices and institutions
 - a. Universal or prevalent ethical and religious practices
 - b. Monastic institutions: the characteristics and role of the *saṅgha*
 - c. Ceremonies and festivals: the religious year, popular traditions, passage rites
 - d. Regional variations in practices
4. The religious and cultural role of Buddhist art
 - a. Symbolism and iconography
 - b. Religious expression in the arts
5. The relationship of Buddhism to nationalist movements: its contemporary situation, its prospects

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major article dealing with Buddhism

Buddhism, The Buddha and

MICROPAEDIA: Selected entries of reference information

General subjects

<i>deities and mythology:</i>	Ni-ō	Nichiren	<i>offices and personages:</i>
Amitābha	Samvara	Buddhism	bhikku
Avalokiteśvara	Shih Wang	Pure Land	bodhisattva
Bhaiṣajya-guru	Tārā	Buddhism	cakravartin
brahma-loka	Vairocana	Reiyū-kai	Dalai Lama
dharmapāla	Vajrapāṇi	Rinzai	lama
Dhyāni-Buddha	Vajrayoginī	Risshō-Kōsei-kai	mahāsiddha
Five Great Kings	yi-dam	Ritsu	Nechung oracle
Hārītī	<i>forms, sects, schools, and orders:</i>	Rnying-ma-pa	Panchen Lama
Hevajra	Bka'-brgyud-pa	Sammatīya	pratyeka-buddha
Kṣitigarbha	Dge-lugs-pa	Sarvāstivāda	upāsaka
lokapāla	eighteen schools	Sautrāntika	<i>philosophy and doctrine:</i>
Lumbinī	Hinayāna	Shingon	Abhidharmakośa
Mahā Māyā	Jōjitsu	Sōka-gakkai	abhijñā
mahāpuruṣa	Kegon	Sōtō	akriyāvāda
Maitreya	Kusha	Theravāda	ālaya-vijñāna
Mañjuśrī	Mādhyamika	Tibetan Buddhism	anatta
Māra	Mahāsaṅghika	T'ien-t'ai	arhat
Myō-ō	Mahāyāna	Vajrayāna	ariya-puggala
nāman		Yogācāra	
		Zen	

arūpa-loka	Buddhist	Bhadracaryā-	butōdan
āsrava	meditation	prapñdhāna	caitya
bhava-cakra	dhārani	bhāṇavāra	Crāndhāra art
bhūmi	good	Bka'-gyur	Jōgan style
bodhi	gtor-ma	Butan-'gyur	kapāla
brahma-loka	koan	Buddhacarita	kara-yō
brahmacarya	kyōto	Dhammapadam	Manichaeist
brahmavihāra	mandala	Diamond Sūtra	mandala
dharma	mantra	gsung-'bum	Mathurā art
dukkha	mudra	Guhyasamāja	mudra
Eightfold Path	nang-mchod	Tantra	Northern Wei
Four Noble Truths	pahhajjā	Heart Sūtra	sculpture
kaṃmatjñāna	perambula	Isana	pagoda
karman	pātimokkha	Khuddaka Nikāya	prayer wheel
Kegon	phyl-mchod	Lanka-vatara	Varaṇasi sculpture
Kusha	sadhana	Laṅkāvatāra-sūtra	stūpa
Mādhyamika	sangha	Lotus Sūtra	Sukhothai style
mahāmudrā	Smon-lam	Mahāvairocana-	Tempyō style
Nirvāṇa	chen-mo	sūtra	Tenjiku
pāramitā	upasampadā	Mahāvastu	thang-ka
prajñapti	uposatha	Mahāvāna-śrad-	thread cross
Pramāṇa-vārttika	vassa	dhotpāda-śāstra	T'ien-lung Shan
pratītya-samutpāda	vihāra	Milinda-pañha	Tōdai Temple
pratyaya	zazen	Mūlamādhyama-	U Thong style
puñña	<i>sacred and secular</i>	kakārikā	vajra
saddhā	<i>literature:</i>	Prajñāpāramitā	yab-yum
samadhi	Abhidhamma	Pramāṇa-vārttika	Yün-kang tower
saṃsāra	Piñcha	Pure Land Sūtra	zener
saṃvṛti-satya	Abhidhammattha-	Satyasiddhi-śāstra	Abhayagiri
Sarvāstivāda	saṅgaha	sūtra	Bor
Savara	Abhidhammaśāstra	śūtra Piñcha	Buddhist council
śāstra	Abhidhammaśāstra	Sūtrapiṇḍa	Manichaeist
skandha	Abhisamayālaṅ-	Ta-ts'ang Ching	mappō
smṛtyupasthāna	kāraloka	Tipiṭaka	rock edicts
Tiratna	Amitāyur-dhyāna-sūtra	Vinaya Piñcha	
trivabhāva	āṅgā	<i>symbolism,</i>	
<i>practices and</i>	aṭṭhakathā	<i>iconography, and</i>	
<i>institutions:</i>	Avadāna	<i>ritual objects:</i>	
abhiṣeka	Avatamsaka-sūtra	Borobudur	
Biographies			
Asaṅga	Fa-hsien	Hui-neng	Padmasambhava
Aśoka	Hasegawa Tōhaku	Kūkai	Shinran
Bodhidharma	Hōnen	Nāgārjuna	
Dōgen	Hsüan-tsang	Nichiren	

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Section 825. Indigenous Religions of East Asia: Religions of China, Korea, and Japan

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2. History of religion in China
 - a. The emergence of Chinese religion: ancestor worship, early cosmological beliefs
 - b. The formulation of the Great Tradition: the development of the Confucian and Taoist ways (6th–1st century BC)
 - c. The dominance of the Buddhist Way and the rise of Taoist-inspired cults (1st–16th century)
 - d. The modern period: the effects of Western religions and of nationalism and secularism on familial and social systems

3. Traditional concepts in Chinese religious thought: the relation of the individual to the cosmos and to society
4. Ritual practices and institutions
5. Chinese religious symbolism
6. Chinese mythology

B. Confucianism

1. History of Confucianism
 - a. Background in the institutions of the predynastic sage-emperors and the founders of the first three dynasties
 - b. Origin in the life and teachings of Confucius (551–479 BC), the first Sage
 - c. The Confucian school and its various forms: the teachings of Mencius, the second Sage, and of Hsün-tzu (c. 5th–3rd century BC)
 - d. Establishment of Confucianism as the state orthodoxy of the Han Empire: eclectic tendencies, skeptical and rationalistic reactions (2nd century BC–3rd century AD)
 - e. Introduction of Confucianism into Korea and Japan (1st and 4th centuries AD)
[see D. and E., below]
 - f. Confucianism during the time of Buddhist ascendancy: its continued role in the family system, the government bureaucracy, and the examination system; textual studies
 - g. The emergence and development of Neo-Confucianism (11th–20th century): metaphysical and humanistic emphases, the teaching of Chu Hsi, the development of Neo-Confucian schools
 - h. Varied responses to intellectual and material challenges of the West and to other developments: reformist and conservative movements, the effect of political developments on Confucian ideology and scholarship
 - i. Confucianism today: its current demographic and social aspects
2. Confucian literature
3. Confucianism as a religion and as a philosophy

C. Taoism

1. History of Taoism
 - a. Origin and early developments: the first evidence of the teachings of Lao-tzu and Chuang-tzu (c. 4th–3rd century BC)
 - b. Developments during the Ch'in and Han periods (3rd century BC–3rd century AD): esoteric traditions, the Huang-Lao tradition, revolutionary messianism, developments in philosophy
 - c. Developments from the 2nd to the 6th century: brief recognition of Taoism as the state religion; interaction with Buddhism; ceremonial, alchemical, and scriptural traditions
 - d. Developments under the T'ang, Sung, and later dynasties: internal developments, the role of alchemy, syncretistic tendencies
 - e. The later development of philosophical and religious Taoism from the 14th century to the present time
2. Taoist literature
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D. The religions of Korea

1. History of Korean religion from prehistoric times to the present: the influence of Chinese, Japanese, and Western religions
2. Religious literature and mythology
3. Beliefs and doctrines
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E. The religions of Japan

1. History of Japanese religion
 - a. Early clan religion before the 6th century AD

- b. Early historic and medieval periods (6th–16th century): the introduction of Buddhism, the impact of Chinese influences on Shintō, other developments
- c. The Tokugawa era (1603–1867): Neo-Confucian Shintō, Sect Shintō, other developments
- d. The Meiji era and after (1868 to the present): new religious movements
2. Shintō: the Way of the Gods
 - a. History of Shintō
[see E.1., above]
 - b. Characteristics of primitive Shintō: the role of guardian shrines and shamans
 - c. Shintō literature and mythology: the form and content of the *Kojiki*, *Nihon shoki*, and other writings
 - d. Basic beliefs and doctrines: concepts of mankind, the sacred and related precepts and principles
 - e. Ritual practices and institutions
3. Japanese religious art and symbolism
4. Japanese mythology

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with indigenous religions of East Asia: religions of China, Korea, and Japan

Chinese Literature	Shintō
Confucianism, Confucius and	Taoism
Japanese Literature	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>Chinese deities and mythology:</i>	shen	Shu Ching	Susanoo
Chang Kuo-lao	Shen Nung	Ssu shu	tengu
Ch'ang O	Shou Hsing	Ta hsüeh	ujigami
Ch'eng Huang	Shun	Tso chuan	Ukemochi no
ch'i-lin	Ta Yü	Wu ching	kami
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Fu Shen	Tsao Shen	Daikoku	Hōtoku
Han Hsiang	T'u-ti	Ebisu	Kirishitan
Ho Hsien-ku	Wen Ti	Fukurokuju	Kokugaku
Hou Chi	Wu hsing	goryō	Konkō-kyō
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Hou T'u	Yü Ti	hitogami	Neo-Confucianism
Hsi Wang Mu	<i>Confucianism—philosophy:</i>	Ho-musubi	Ōmoto
Huang-ti	Confucianism	Inari	PL Kyōdan
Kuan Ti	hsiao	Izanagi and	Shinbutsu shūgō
K'uei Hsing	jen	Izanami	Shingaku
Lei Kung	li	Jimmu	Tenshō Kōtai
Li T'ieh-kuai	T'ien Ming	kami	Jingū-kyō
Lu Hsing	<i>Confucianism—sacred literature:</i>	kappa	<i>Korean religion:</i>
Lü Tung-pin	Chou li	Kusanagi	Ch'ōndogyo
lung	Ch'un-ch'iu	Ninigi	mudang
Men Shen	Chung yung	Ōkuninushi	P'alkwanhoe
Nü Kua	I Ching	Sarudahiko	Poch'ōngyo
Pa Hsien	Li chi	Shichi-fuku-jin	p'ungsuchirisol
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<u>Biographies</u>			
Ch'eng Hao and	Hayashi Razan	Lieh-tzu	Tung Chung-shu
Ch'eng I	Hsün-tzu	Mencius	Wang Ch'ung
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Section 826. Judaism

A. History of Judaism

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2. The Hellenistic era
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3. The Talmudic era in Palestine and Babylonia: the foundations of rabbinic Judaism
[see also B.3., below]
4. The medieval era: the European and Islāmic phases of rabbinic Judaism (7th–18th century)
5. The modern era from c. mid-18th century: developments in modern Judaism
6. Judaism today: its current demographic and social aspects

B. Intellectual, spiritual, and imaginative expressions of Judaism

[see also C.4., below]

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- a. Canons, texts, and vernacular versions of the Bible; e.g., Septuagint, Targum
- b. TaNaKh, the Hebrew Bible: Torah, Nevi'im, Ketuvim
- c. Noncanonical literature: Apocrypha, pseudepigrapha

2. Qumrān literature (Dead Sea Scrolls)

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4. Judaic exegesis and hermeneutics

5. Mystical and devotional writings

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- b. Doctrines concerning the Jewish people: the concept of Covenant
[see also 811.D.10.]
- c. Doctrines concerning mankind
- d. Doctrines concerning the universe

- e. Eschatology: views about the future age of mankind and the world, the King-Messiah and his reign
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 - a. Individual and familial practices
 - b. Synagogue practices and other public institutions: the role of the rabbi, chief rabbimates, and general councils and conferences
 - c. Sacred times: the sabbath, the Jewish holidays
 - d. Sacred places: the land of Israel and Jerusalem
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- 3. Present-day forms of Judaism
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 - b. Reform, or Liberal, Judaism
 - c. Conservative Judaism
 - d. Other variations in belief and practices: Reconstructionism, Hasidism, regional or ethnic groups
- 4. Art and iconography
 - a. The anti-iconic principle: the influence of the biblical prohibition against idolatry
 - b. Uses of the visual arts in ceremony and ritual: ceremonial objects, synagogue architecture, paintings, manuscript illumination
 - c. Music: Jewish liturgical modes, the influence of folk traditions, vocal and instrumental music
 - d. Literature: traditional legends and poetic exegesis, later religious poetry and tales

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and a biography dealing with Judaism

Doctrines and Dogmas, Religious
Judaism
Moses

MICROPAEDIA: Selected entries of reference information

General subjects

<i>beliefs and doctrines:</i>	Dead Sea Scrolls	Jonah, Book of	Solomon, Song of
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<i>Bible:</i>	Hosea, Book of	Old Testament	Orthodox Judaism
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Merkava
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*Biographies**Biblical figures:*

Abraham
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 - b. Post-apostolic developments in the early Christian Church (c. AD 70–325)
2. The early Christian Church from the reign of Constantine to the pontificate of Gregory I the Great (c. 4th–6th century)
 - a. The establishment of Christianity as the state religion of the Roman Empire: the problem of the alliance between church and empire, the increasingly important role played by the bishop of Rome as pope
 - b. Doctrinal controversies that occasioned the further development of Christian theology: reaction to the teachings of Novatian, Donatus, Pelagius, and Arius; the role of St. Augustine; the councils of Nicaea (AD 325), Constantinople (381), Ephesus (431), and Chalcedon (451)
 - c. The relation of the Christian religion to the culture of the late empire
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 - a. The political and religious bases of increasing tensions between Rome and Constantinople
 - b. The relation of Christianity to Western and Byzantine cultures (7th–11th century)
 - c. Developments affecting institutions and practices in the East and the West: the expansion of Christianity in the West, the rise of the independent churches in the East
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 - a. Eastern Orthodoxy under the Ottomans (1453–1821)
 - b. The Church of Russia (to 1800)
3. The Orthodox churches in the 19th century: developments in various areas
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 - a. Development of the papacy as the chief spiritual and temporal power in the West
 - b. Religious and cultural characteristics of Latin Christianity
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 - e. Missionary endeavours in other areas: the role of the church in the explorations and colonial policies of the European powers
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 - b. Luther and the German Reformation
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 - c. The Reformation in Switzerland, France, and the Low Countries
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 - e. Expansion of the Reformation to Scandinavia, the Baltic states, and eastern, central, and southern Europe
 - f. Radical reform movements
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 - h. The wars of religion: church–state relations and the gradual development of the concept of religious liberty during the 16th and 17th centuries
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 - a. Political developments affecting the continental Protestant churches
 - b. Developments in German Protestantism
 - c. The challenge of rationalism, Deism, and the Enlightenment: the Protestant response
 - d. Developments in English Protestantism
 - e. Developments in American Protestantism during the Colonial period
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2. Biblical exegesis and hermeneutics
3. Patristic literature: the writings of the Church Fathers
4. Formal, official statements of beliefs and doctrines: creeds, dogmas, confessions of faith
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 - b. The self-revelation of God: the understanding of God as Creator, Sustainer, and Judge
 - c. Christology: teachings concerning the person of Jesus Christ
 - d. Eschatology: political and apocalyptic messianic concepts, expectation of the Kingdom of God
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 - e. The role of the Holy Spirit in the church: the tensions between continuity and revolution, institutional authority and charismatic activity, and order and freedom
 - f. The doctrine of the Holy Trinity
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 3. Doctrines concerning the physical world
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 6. Practices and institutions common or predominant among the various traditional forms of Christianity
 - a. The structure of church institutions: canon law and church polity
 - b. The role and characteristics of the liturgy: the church as a worshiping community, the church year
 - c. Forms of Christian life: monasticism, the saintly life
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 - b. The expression of Christian faith and themes in the arts
- G. The major traditional forms of Christianity
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 - a. Historical development
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 - b. The Orthodox Church: general characteristics deriving from its historical development
 - c. Teachings, forms of worship, and principles of organization that distinguish Eastern Christianity from Roman Catholicism and Protestantism
 - d. The relationship of Eastern Orthodoxy to recent social movements
 - e. Traditional (national) Eastern Orthodox churches; *e.g.*, the Russian Orthodox Church, the Church of Greece
 - f. Eastern Christian Independent churches: Syrian Orthodox Patriarchate of Antioch; Armenian Apostolic Church; Coptic Orthodox Church; Ethiopian Orthodox Church; Malabar Christians; Nestorian (Assyrian) Church
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 - b. The Roman Catholic Church: general characteristics deriving from its historical development
 - c. Teachings, forms of worship, and principles of organization that distinguish the Catholic tradition from that of Eastern Orthodoxy and Protestantism

- d. The response of the Catholic Church to recent social and political developments
- e. The Eastern rite (Uniate) churches: ethnically and nationally distinct churches in canonical communion with the Roman Apostolic See
- f. Old Catholic churches: churches that separated from the see of Rome after the first Vatican Council
- 3. Protestantism
 - a. The Reformation and the historical development of Protestantism
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 - b. Teachings, forms of worship, and principles of organization distinguishing the Protestant heritage from that of Roman Catholicism and Eastern Orthodoxy
 - c. The influence of Protestantism on modern political and social thought
 - d. Major forms of Protestantism: historical development, teachings, forms of worship, and organization
 - i. Lutheran churches
 - ii. Reformed and Presbyterian churches: Calvinism
 - iii. The Anglican Communion
 - iv. The Free churches: Baptists, Disciples of Christ, Congregationalists, Methodists
 - e. Variations of the traditional forms of Protestantism
 - i. Holiness churches
 - ii. Pentecostal churches
 - iii. Millenarian churches: Adventists, Jehovah's Witnesses
 - iv. Society of Friends (Quakers)
 - v. Unitarians and Universalists
 - vi. Old-line Protestant sects and their derivations: Mennonites (including Amish and Hutterites), the Moravian Church, Brethren
 - vii. Other independent churches: various fundamentalist, evangelical, and other sectarian groups
 - viii. Variations of traditional Protestant faiths in black American society
- H. Sects and movements tangentially related to traditional Christianity
 - 1. New Thought: Unity and other groups
 - 2. Christian Science
 - 3. Mormonism
- I. Ecumenical, interdenominational, and intradenominational associations

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with Christianity

Biblical Literature and Its Critical Interpretation	Jesus: The Christ and Christology
Calvinism, Calvin and Christianity	Luther
Doctrines and Dogmas, Religious	Paul, The Apostle
Eastern Orthodoxy	Protestantism
	Roman Catholicism
	Sacred Offices and Orders

MICROPAEDIA: Selected entries of reference information

General subjects

<i>belief, doctrine, and dogma:</i>	Alpha and Omega	apostasy	atonement
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adiaphorism	angel	succession	blasphemy
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Baptist Missionary Association of America	Evangelical Church in Germany, The	Christian Catholic Church	Evangelical Church of Czech Brethren
Baptist Union of Great Britain and Ireland	Evangelical Church of Czech Brethren	Jehovah's Witness	Free Church of Scotland
National Association of Free Will Baptists	Evangelical Lutheran Church in America	Plymouth Brethren	Iona Community
National Baptist Convention of America	Evangelical Lutheran People's Church of Denmark	Shaker	Netherlands Reformed Church, The
National Primitive Baptist Convention, Inc.	Finland, Church of	<i>churches—Protestant (old-line):</i>	Presbyterian Church (U.S.A.)
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Holiness movement	<i>churches—Protestant (Methodist):</i>	God, Church of	<i>churches—Protestant (Unitarian and Universalists):</i>
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Pillar of Fire	African Methodist Episcopal Zion Church	International Church of the Foursquare Gospel	Universalist Association
United House of Prayer for All People	Christian Methodist Episcopal Church	Jesus Only	Unitarianism
Wesleyan Church	Episcopal Church	Latter Rain revival	Universalism
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Augustana Evangelical Lutheran Church	United Methodist Church	Pentecostal Church of God of America, Inc.	General Council of Congregational Christian Churches
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| Evangelical Alliance | Peace Mission Reorganized Church of Jesus Christ of Latter-day Saints | Clergy Reserves | Institutes of the Christian Religion |
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| Old Catholic Church of The Netherlands | Anabaptist anticlericalism | Dukhobor | Neoorthodoxy |
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Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with Islām

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Allāh	kalām	Almoravids	Sālimiyah
ʿaql	kasb	Badr, Battle of	<i>myth, legend,</i>
ʿāriyah	kiswah	Bāṭiniyah	<i>eschatology:</i>
bid'ah	Mālikiyah	caliph	Barṣīṣa
Dahriyah	mufti	Caliphate	Buraq
diyah	Mu'tazilah	Companions of the	Dajjal, ad-
fayḍ	Qadariyah	Prophet	Dhu al-faqar
ghaybah	qāḍi	Dīn-i Ilāhi	ghūl
Ḥadīth	qiyas	Ditch, Battle of the	Harut and Marut
Ḥanābilah	raqā'	Hāshimiyah	hātif
Hanafiyah	rahbāniyah	Hegira	hourī
ʿiddah	Shāfi'iyah	Ḥudaybiyah, Pact	Iblīs
ijmā'	Shari'ah	of Al-	Idris
ijtihād	shirk	Ikhwān aṣ-Ṣafā'	ifrit
ikhtilāf	taqlid	imam	Isra'
ʿilm al-ḥadīth	tashbih	jizya	Israfīl
imam		kharāj	'Izra'īl

jahannam	Hegira	zakat	ḥāl
Jibrīl	ʿīd	zāwiyah	ḥaqīqah
jinnī	ihram	ziyārah	kashf
Khiḍr, al-	jihād	zuhd	khirqah
mahdī	jum'ah	<i>sects, schools,</i>	Malāmatīyah
Mikāl	Ka'bah	<i>branches:</i>	maqām
mi'rāj	khitān	ʿAlawite	Mawlawīyah
shaitan	khuṭbah	Bohrā	mujāhadah
Sheba, Queen of	mawlid	Deoband school	mushāhadah
Yājūj and Mājūj	minaret	Dönme	Naqshbandīyah
<i>offices and orders:</i>	minbar	Druze	Qādirīyah
caliph	mosque	Ismā'īlite	Qalandariyah
imam	muezzin	Ithnā ʿAshariyah	Rifā'īyah
marabout	mullah	Khārijite	samā'
qurrā'	mut'ah	Mahdist	shaṭṭ
Shādhiliyah	purdah	Māturīdiyah	Shaṭṭāriyah
<i>Qur'ānic literature:</i>	qibla	Mu'tazilah	Subud
basmalah	rajm	Rāfiḍah	Şūfism
fātiḥah	Ramaḍān	Shī'ite	Suhrawardīyah
fawātiḥ	salat	Şūfism	tariqa
Qur'ān	şawm	Sunnite	<i>other:</i>
surah	sayyid	Wahhābi	Ahl-e Ḥaqq
<i>ritual, practice,</i>	sharif	Yazidi	American Muslim
<i>observance:</i>	subḥah	<i>Şūfism:</i>	Mission
adhān	sunna	Aḥmadiyah	Islām
ʿĀshūrā'	tafsīr	Bektashi	Muhammadiyah
Black Stone of	tahajjud	Chishtīyah	M'zabite
Mecca	talbiyah	dervish	sheikh
crescent	taqiya	dhikr	ulama
ghusl	tazia	fakir	
hajj	ʿumrah	fana	
Biographies			
<i>leaders and teachers:</i>	Jalāl ad-Dīn	<i>theologians and</i>	Ghazālī, al-
ʿAbd Allāh	ar-Rūmī	<i>philosophers:</i>	Ḥasan
Abū Bakr	Jamāl ad-Dīn	ʿAbduh,	al-Baṣrī, al-
Ahmad Khan, Sir	al-Afghānī	Muḥammad	Ibn al-ʿArabī
Sayyid	Junayd, Shaykh	Abū Ḥanīfah	Ibn ʿAqīl
Aḥsā'ī, al-	Mahdī, al-	Aḥmad ibn	Ibn Ḥazm
ʿAlī	Muḥammad	Ḥanbal	Ibn Taymiyah
Ghaznavid	Rashīd Riḍā	Ash'arī, Abū	Muḥāsibī, al-
Dynasty	Sha'rānī, ash-	al-Ḥasan al-	Sirhindī, Shaykh
Ḥallāj, al-	ʿUmar I	Averroës	Aḥmad
Ja'far ibn	ʿUmar II	Avicenna	Suhrawardī, as-
Muḥammad	ʿUmar Tal	Fakhr ad-Dīn	Ṭabarī, aṭ-
		ar-Rāzī	

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Section 829. Other Religions and Religious Movements in the Modern World

- A. New religious movements reflecting the impact of dominant cultures and religions
- B. Negro cults in Western cultures
 1. The Nation of Islām, or Black Muslims
[see E.3., below]
 2. Black Jewish cults: the Church of God; the Commandment Keepers, or Black Jews; the Church of God and Saints of Christ
- C. Theosophical groups

D. Spiritualist groups

E. Religions and religious movements of Islāmic origin or influenced by Islām

1. The Bahā'ī faith
2. The Druze religion
3. The Nation of Islām, or Black Muslims

F. Residues or revivals of ancient and primitive religious beliefs and practices in modern civilizations

1. Witchcraft, black magic, Satanism
[see also 811.F.]
2. Prophecy, divination, astrology
3. Healing cults or practices
4. Pharmacological cults or practices

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with other religions and religious movements in the modern world

Doctrines and Dogmas, Religious
Occultism

MICROPAEDIA: Selected entries of reference information

General subjects

Aladura	Hare Krishna	Maria Legio	Rizalist cult
alchemy	Harris movement	mashriq al-adhkār	Rosicrucian
anthroposophy	Hauhau	Moorish Science	Santería
astrology	healing cult	Temple of	Scientology
Azalī	ḥudūd, al-	America	spiritual assembly
Bahā'ī faith	I Am movement	Native American	Telakhon
Braid movement	Iglesia ni Kristo	Church	theosophy
Cao Dai	Indian Shaker	New Thought	Unification
cargo cult	Church	Peace Mission	Church
divination	Islam, Nation of	Psychiana	'uqqāl
Druze	Kimbanguist	Rastafarian	voodoo
Ethiopianism	church	Ratana church	witchcraft
faith healing	Kuga Sorta	Religious Science	Zionist church
Ghost Dance	Macumba	Ringatu	
Handsome Lake	magic		
cult			

Biographies

Bāb, the	Divine, Father	Mahesh Yogi,	Muhammad,
Bhaktivedanta,	Fard, Wallace D.	Maharishi	Elijah
A.C.	Gurdjieff, Georges	Moon, Sun Myung	Smohalla
Blavatsky, Helena	Ivanovitch		Steiner, Rudolf
Petrovna			

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Introduction to Part Nine:

The Point and Pleasure of Reading History

by Jacques Barzun

Everything that we call the arts and the humanities comes out of some natural desire and acquires value by satisfying it. Painting and music and literature are important not because there are museums and concert halls and libraries to be kept supplied but because human beings want to draw and sing and tell stories as well as enjoy seeing others fulfill these native and universal impulses.

Among the humanities, history holds a special place in that its origin within each of us is not even dependent on impulse. A person may lack altogether the wish to sing or the knack of telling a story, but everybody without exception finds occasion to say: "I was there; I saw it; I remember it very well." In saying (or even thinking) these words, every man is a historian. History is inescapably a part of consciousness. The Greeks expressed this truth by describing Clio, the muse of history, as the daughter of memory.

Without going into the subtleties of how we are able to remember and what the contents of memory actually are, it is clear that as soon as we take thought about our experiences, whether the farthest back or the nearest and most immediate, we are dealing with what is past. The so-called present vanishes in the very act of reflecting upon it, and the future is all surmise and imagination. Hence the greater our interest in the facts and truths of human existence—our own existence included—the greater, necessarily, is our concern with the past. "To live in the past" ought not, therefore, to be the phrase of reproach that it commonly is. The larger part of the thoughtful life that one leads during the intervals of action cannot be anything but some form of living in the past. If this part of our lives is to be criticized, it should be in words different from the cliché. One should ask, *How* does he or she live in the past? *What past* does he or she recall, prefer, imagine?

It is at this point that history as the organized story of the whole human past comes in to contribute its pleasures and its illumination to the thoughtful life. A person who remembered only his own past would be pretty poor indeed—living on a starvation diet. Actually, it is a question whether such a life is not an impossible supposition. Everybody remembers pieces of other people's pasts; everybody, whether he means to or not, finds that he has learned about his country, his town, his street, his business office, or his factory many things that came to pass well before his time. To possess that information, if it is accurate, is in essence a knowledge of history. It differs in extent but not in kind from a knowledge of how Rome rose and fell. And this relation tells us what reading history affords in the first instance. Just as knowing about our neighbours' and friends' histories adds to our sense of reality, so does reading history; it gives us vicarious experience.

If we add to the habitual, unconscious intake of personal and local history the daily filling of the mind by news

reports—which is contemporary history and which usually brings with it fragments of a remoter past—we begin to see that every man who lives in a modern, communicative society is forced to become in some sense a conscious historian. His interest begins with himself and his environment, but it is soon stretched out, haphazardly, into such domains of history as chance or special interests have developed. And special interests need not mean explicitly intellectual ones; baseball and chess, model trains and furniture, pottery and boat-building have their heroes and revolutions too, and whoever cares about these activities or artifacts for themselves inevitably becomes engrossed in their histories.

It is of course true that when we ordinarily speak of someone having an interest in history we mean the political, social, or cultural history of great civilizations; and for a long time history was arbitrarily taken to mean the sequence that leads from the ancient civilizations of the eastern Mediterranean to the modern ones of the West. It is a tremendous spectacle, even though concentrated on a relatively small territory. But now that certain dynamic elements of Western civilization have aroused the rest of the world to both imitation and resistance, it has become imperative to widen the panorama and see behind the vast and confused modern scene the several histories of the great Eastern civilizations as well as the traditions and vicissitudes of the African societies.

Two questions readily occur at the mere thought of so much to know. Can a reader who is not a professional historian find his way in this huge maze of names, dates, and facts? And if he can, why should he? The answer to the first question is the old reply of the mathematician to the nervous student: "What one fool can do, another can." A real compliment is concealed in this gruff retort, for what it implies is that given an interest, a motive, any man can inform himself about any part of world history through secondary accounts such as are digested in an encyclopaedia. There is no obligation to master every detail, to dispute or criticize sources—in a word, to ape the professional, who, for the best of reasons, limits himself to a small segment of the whole. A *reader* of history is one who follows with his mind the steps another took on his voyage of discovery; and this is easier in history than in mathematics, for history is told in plain words and deals with ordinary human relationships.

So the main difficulty lies in the second question: Why embark on the journey? The answers are numerous and varied, for temperaments differ, as do "special interests" in the sense referred to above. But there is one answer that covers the rest: it is the answer suggested by what was said earlier about every man's unconscious absorption of haphazard fragments of history. The best motive for reading history deliberately is curiosity about the portions missing

from one's own picture of the past. Curiosity: How did things come to be as they are? How was it when they were different? Is it true that once upon a time men did thus and so? History deals with particulars, and most recorded particulars contain puzzles, contradictions, enormities, all of them spurs to curiosity: the Hudson River in the state of New York was named after the navigator often called Hendrik Hudson, who first sailed up the stream. But why Hendrik and not Henry? Well, Henry was his baptismal name; how did he acquire the other and why? The full answer leads really to a comprehensive view of exploration and colonization by the national states at the dawn of the modern age—the aims, drives, desires, errors, follies, cruelties, and incalculable consequences of a great movement that occupies two and a half centuries and that has continued in different forms down to the landings on the Moon.

The most striking feature of history is its fusion of purposeful direction and unexpected drift. For example, read about Plato, Aristotle, and the ancient mathematicians, and you will discover how their speculations and discoveries have been transformed and amplified into the methods and systems that we still work with. But you will also be told how at various times these same streams of thought or belief generated entirely new and remote, strange and absurd consequences. Again, ancient astrology led to the science of astronomy, and science (as we think) replaces superstition. Yet astrology fills columns in 20th-century newspapers and the minds of their millions of readers. What is the explanation? We lack the pythoness of Delphi, in whom Socrates believed or affected to believe, and we have no official college of augurs to scan the entrails of birds as a guide to future political action, but fortune-tellers are never out of business and we do have Gallup polls. Truly, the wonders of cultural history are infinite.

To conjure up these beliefs and institutions in this comparative fashion is not to equate them with one another or across the centuries; it is rather to stress the identity in diversity that is the principle of human affairs and that makes human history accessible to any willing reader. In different times and places, men are the same and also different. The differences are due to the varying emphases given by one people at one time to some element of life and feeling or to some form of its expression. This is most easily seen in the plastic arts. Think of the representations of the human body in Egypt, Greece, medieval Europe, the west coast of Africa, pre-Columbian America, and the art galleries of world capitals in the second half of the 20th century: is it the same human body or different? The question is really idle, for it is both and neither. In paint or marble there is strictly no human body, only a view of it, a feeling about it. Similarly, what we see in history is not so much Man distorted in one way or another as *men* who existed *only as we see them*; that is, in their society and culture, under their skies and gods, never staying put for more than a short time, never to be reduplicated elsewhere or at a later time, even when the effort to imitate is strong and shrewd—as in the Italian Renaissance, which tried to restore the ancient culture of Greece and Rome.

Despite this irreducible plasticity, diversity, and restlessness, we draw historical parallels, we make comparisons. That we can do so is what persuades us of the unity and continuity of history. When we find the Celtic druids and

the Aztecs making human sacrifices to their gods we say we recognize a human tendency, though we profess to abhor it. Yet some future reader of history might be tempted to compare with those ancient peoples our contemporary revolutionists, who sacrifice 400,000 kulaks (or some other hapless group) for the good of the tribe and its eternal prosperity. But we also notice a strange difference: we know that fanatical faith presides over each type of human sacrifice, ancient and modern, but even as we condemn we think we understand the modern more readily: we know its background, have heard its advocates. It is one of the illuminations of history, not merely to know abstractly, but, by learning the local shape of things, to feel how the reality of each time and place differs; how the faiths diverge in contents and origins and thus in persuasiveness. We may now lump together the Celts and the Aztecs, but they were far apart in thought and character: in short, nothing is truly comparable; in history everything is *sui generis*.

The wise reader of history keeps his equilibrium between these two extremes of likeness and difference. He tries to see the unfamiliar in the familiar, and vice versa. He stands away from his own prejudices and satisfies his curiosity by trying to sympathize with what is farthest away or most alien. This is very hard to do when what is before us is a bloody sacrifice, a massacre, a piece of treachery or cynical greed that violates our sensibilities as well as our moral principles. But to sympathize is not to condone or approve, it is only to acknowledge in oneself the ever-present possibility of the same feeling or action. Certainly the enlightened 20th century has no warrant for looking down on times and places where treachery and massacre were commonplace. And it is a sobering observation to find in both past and present the evidence that inhumanities have been and are being committed by the brutish and civilized alike, the ignorant and the educated, the cynical and the devout, the selfish and the heroic.

A principal good derived from history is thus an increase in self-knowledge, through a fellow-feeling with men singly and in groups as history tells about them. That self-knowledge in turn makes the reader of history less ready to find "monsters of error" in his own time and place. Let it be said again, he need not condone or accept with indifference, but he is spared one of the very errors that perpetuates man's inhumanity to man—fanatical self-righteousness.

On the constructive side, what history tells is the long series of efforts to overcome the constraints of nature and the difficulties of living in society. Those efforts we call civilizations. They start small. In the West they first take the form of city-states. They clash, with one another or with the barbarians "outside." Trade and war, war and trade expand the scope of power, government, and law. Great men introduce broader conceptions of citizenship, morals, and religions. Others invent practical devices of administration, manufacture, and—again—war. Still others discover the workings of nature, create mathematics or art or systems of philosophy. A concentration of such activities over a given territory is what is meant by a high civilization—Egypt, Greece, the Hellenistic Age, Rome, the Saracens, the High Middle Ages, the Renaissance. And also China, Japan, the Khmers, India, the Mayas, the Incas, and so on.

Along this hazardous and always violent course, innumerable characters rise and play their parts. Their fates

provide stories within the story. Visibly, biographies are the bricks of which history is made, for the story of mankind can only be the stories of men. But by a paradox of man's social existence, the life of communities is not a simple sum of individual lives. The reader of history must therefore imagine from the printed page characteristic acts, moods, errors, disasters, achievements that are nobody's doing and everybody's doing. This imagining is another important good bestowed by historical reading, for it dispels the illusion that H.G. Wells called the "governess view" of history: They (the bad people) are doing this terrible thing to Us (the good people). The fallacy in it is to suppose that any large group acts as with one mind, clear in purpose and aware of consequences. Such a projection of the single ego upon whole masses is a form of provincialism that is encountered in most political discussions and certainly in all social prejudices: "If the President would only act . . . if those people would only see reason. . . ." A reader of history is cured of this simple-mindedness by developing a new sense—the historical sense—of how mankind in the mass behaves, neither free nor fatally pushed, and in its clearest actions mysterious even to itself.

It is this peculiarity that, while marking the difference between history and biography (where acts can be deemed individual and responsible), has led many minds to postulate a meaning in history, a meaning discoverable but obscured by the multiplicity and confusion of facts. A famous passage in Cardinal Newman's *Apologia* records in admirable prose the feelings that lead to the elaboration of philosophies of history: for Newman it is of course the traditional Christian interpretation that unifies the multiplicity and resolves the confusion:

To consider the world in its length and breadth, its various history, the many races of man, their starts, their fortunes, their mutual alienation, their conflicts; and then their ways, habits, governments, forms of worship; their enterprises, their aimless courses, their random achievements and acquirements, the impotent conclusion of long-standing facts, the tokens so faint and broken, of a superintending design, the blind evolution of what turn out to be great powers or truths, the progress of things, as if from unreasoning elements, not towards final causes, the greatness and littleness of man, his far-reaching aims, his short duration, the curtain hung over his futurity, the disappointments of life, the defeat of good, the success of evil, physical pain, mental anguish, the prevalence and intensity of sin, the pervading idolatries, the corruptions, the dreary hopeless irreligion, that condition of the whole race, so fearfully yet exactly described in the Apostle's words, "having no hope and without God in the world,"—all this is a vision to dizzy and appal; and inflicts upon the mind the sense of a profound mystery, which is absolutely beyond human solution.

Other famous philosophies, from Vico's and Hegel's to Marx's and Spengler's, discover a direction in history, or a principle of action, and often a goal or terminus (as in Marx), after which history as we know it shall cease and a kind of second Eden be restored.

To the practical writer or reader of history these philosophies appeal mainly by their suggestiveness; they are valued for their scattered insights and analogies. As systems they negate the very spirit of history, which seeks the concrete and particular, the opposite of system and abstraction. True, there have been historians who took a middle course and attempted to find empirical regularities in history—again with occasionally suggestive results—but very soon their methods begin to do violence to the facts in order to group them and count them and treat them like identities in physical science. When the physical world itself has not yet been fully systematized, to assume or "find" a system in history without the means and the liberties that science uses is to think like neither a scientist nor a historian. It is in fact an attempt to remove the difficulty of history at the cost of destroying its unique merit and interest.

By the "liberties" that science takes is meant the experimenter's elimination of all but a very few components in a given trial, so as to ascertain precisely the nature and amount of a given effect. When this is done, the result is usually stated in causal terms—so much of this, under such and such conditions, will produce so much of that. Hardly anyone needs to be told that history defies a similar treatment. Its elements cannot be exactly measured, and although each historical situation presents to the discerning eye a variety of clear conditions or factors, the isolating of a cause for what happens is beyond reach.

That is but another way of saying that history is and must remain a story. And a story, if properly told, is a whole, to be understood as a whole—synthetically, not analytically. History in this regard resembles the arts. We say we "analyze" a work of art, but that is to speak metaphorically. We can enjoy and understand the products of art only as wholes. In history, the artful story is offered as a true story, and great pains are taken to see that it is true. But except in the broadest sense, the historical wholes are not given as such in the record; they are devised by the historian, to make the welter of facts intelligible and hence able to be remembered. Clio was not only the muse of history but also of eloquence, by which the Greeks meant good, intelligible prose, to be spoken before an audience unused to books. The same requirements still hold; written history must be readable with pleasure, or Clio is defeated.

But, it will be said, from many diverse writers will come divergent stories, rival interpretations. That is true, for only a divine mind could know "how it actually happened." But this limitation of history is also a merit, for it can thereby be written and read over and over again in as many versions as are plausible or accessible. There is and will be no final statement; the perspective forever changes, and with it the interest of history renews itself into infinity. As the philosopher William James once remarked, "What has been concluded that we should conclude about it?"

Part Nine. The History of Mankind

The outlines in the thirty-nine sections, in seven divisions, of Part Nine deal with the history of the peoples and civilizations of the world.

Certain points should be noted about Part Nine.

History, like philosophy, has developed methods applicable to the subject matter of other disciplines. The results of these applications are set forth in other parts. Each of the nine sections of Division II of Part Six includes a historical treatment of each of the arts. Similarly, each of the nine sections of Division II of Part Eight includes a historical treatment of each of the particular religions dealt with. Certain sections of the five divisions of Part Ten set forth the history of logic and mathematics; the history of science generally; the history of each of the natural and social sciences; the history of medicine; the history of technology; the history of philosophy; the history of humanistic scholarship; and the history of historiography and of the study of history itself.

It should also be noted that here and in the other portions of the Outline of Knowledge that treat historical matters, the level of detail is greater than that elsewhere. This reflects the editors' belief that an outline of history imposed upon a geographical or chronological base requires a high degree of particularization.

The topical breakdown of the history of mankind into seven divisions and thirty-nine sections reflects more or less traditional judgments—judgments regarding the regional divisions of world history; the identification of peoples and civilizations; the temporal periodization in historical accounts of particular civilizations; and the periods of relative isolation and of relative confluence of different civilizations.

The titles of the seven divisions in this part indicate the regional and temporal divisions used. Introductory headnotes for each of the seven divisions indicate the temporal periodizations used in the accounts of particular civilizations.

- Division I. Peoples and Civilizations of Ancient Southwest Asia, North Africa, and Europe 343
 - II. Peoples and Civilizations of Medieval Europe, North Africa, and Southwest Asia 356
 - III. Peoples and Traditional Civilizations of East, Central, South, and Southeast Asia 375
 - IV. Peoples and Civilizations of Sub-Saharan Africa to 1885 388
 - V. Peoples and Civilizations of Pre-Columbian America 394
 - VI. The Modern World to 1920 396
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Division I. Peoples and Civilizations of Ancient Southwest Asia, North Africa, and Europe

The outline in Section 911 first treats of the geography of the regions covered in the section, the sources for the history of the peoples in these regions, and the character and achievements of ancient Near Eastern, Aegean, and North African civilizations. It then deals separately with the history of each of the peoples in these regions in ancient times.

The outline in Section 912 begins with the history of the peoples of non-Classical ancient Europe. It then deals with the whole course of the Classical Greco-Roman civilization, extending from the emergence of Classical Greece from Archaic Greece, through the Hellenistic Age and the history of republican Rome, to the history of the Roman Empire up to AD 395.

- Section 911. Early Peoples and Civilizations of Southwest Asia and Egypt, the Aegean, and North Africa 344
- 912. Peoples of Ancient Europe and the Classical Civilizations of the Ancient Mediterranean World to AD 395 350

Section 911. Early Peoples and Civilizations of Southwest Asia and Egypt, the Aegean, and North Africa

- A. The character and achievements of ancient Near Eastern, Aegean, and North African civilizations; the geography of these regions; archaeological and documentary historical sources; historiographic problems
- B. Mesopotamia and Iran to c. 1600 BC
 1. Development of river valley civilization in Mesopotamia
 - a. The Late Neolithic, Chalcolithic, and protohistoric (pre-urban) periods
 - b. The Sumerians from their origins to the end of the Early Dynastic Period (c. 2350 BC)
 - i. Their conjectured origins: literary and other historical sources (king lists and invention of cuneiform writing), early kings and legendary figures (Gilgamesh)
 - ii. Foundation of city-states (e.g., Kish, Ur, Uruk, Lagash, Mari, Umma): rivalry among the cities, the temple city and theocracy, social and economic organization, contacts with Egyptian and Indus Valley civilizations, Sumerian culture
 - c. Sumer and Akkad from c. 2350 to 2000 BC
 - i. The ascendancy of the Semitic Akkadians under Sargon I of Akkad and his successors, invasions and the fall of the dynasty
 - ii. The unification of Sumer, Akkad, and Elam under the 3rd dynasty of Ur (c. 2112–2004 BC): administration and composition of the empire, Ur in decline
 - d. The Old Babylonian Period and the early history of Assyria
 - i. Isin and Larsa: rivalry and political fragmentation, literary texts, decentralization
 - ii. Early Assyria: Ashur, Nineveh, and Urbilum; Akkadian inscriptions and language; the economy; the reign of Shamshi-Adad I (c. 1813–1781 BC)
 - iii. Establishment of the Old Babylonian Empire under the dynasty of Hammurabi (c. 1792–1750 BC): law, society, and literature
 - e. Hurrian expansion to c. 1600 BC and the decline of the Old Babylonian Empire after c. 1750 BC
 2. Early Elam (Iran): cultural ties and political and military interaction with Mesopotamia
- C. Emergence of river valley civilization in Egypt (to c. 1600 BC)
 1. The Predynastic Period (to c. 2925 BC) and the Early Dynastic Period (1st through 3rd dynasties, c. 2925–c. 2575 BC): unification of Upper and Lower Egypt under King Menes (Narmer), capital at Memphis
 2. The Old Kingdom (c. 2575–2130 BC) and the First Intermediate Period (c. 2130–1939 BC)
 - a. The Old Kingdom (4th–8th dynasties, c. 2575–c. 2130 BC): divine kingship; the building of the great pyramids near Memphis; centralized government; class structure; foreign trade; increased provincialization; instability of the throne
 - b. The First Intermediate Period (9th–11th dynasties, c. 2130–1939 BC): governmental decentralization; collapse of the Old Kingdom and ensuing disunity and foreign raids; reunification by Mentuhotep I under the 11th dynasty, ruling from Thebes
 3. The Middle Kingdom (1938–c. 1600 BC) and the Second Intermediate Period (c. 1630–1540 BC)
 - a. The Middle Kingdom (12th–14th dynasties, 1938–c. 1600 BC): the cult of Amon; developments in the monarchical institutions; the conquest of Lower Nubia; trade; immigration
 - b. The Second Intermediate Period (15th–17th dynasties, c. 1630–1540 BC): internal decentralization and the Asiatic Hyksos occupation
- D. Early civilizations in Syria and Palestine, Anatolia, and the Aegean to c. 1600 BC
 1. Emergence of civilization in Syria and Palestine
 - a. The Stone Age cultures and their transition from the Neolithic to the Early Bronze Age until c. 2300 BC, agricultural and technological developments, Proto-Urban settlements, Jericho
 - i. Paleolithic and Mesolithic periods: development of horticulture and the domestication of animals

- ii. Pre-Pottery Neolithic areas, grouped houses and town walls, arrival of new peoples and their rectangular architecture, Pottery Neolithic areas, molded plaster vessels, dark-faced burnished ware and the spread of its associated culture
 - iii. The Chalcolithic Period and the Early Bronze Age: migrations and spread of Halafian culture, development of trade, beginnings of urbanization, Early Bronze Age cities
 - b. The Intermediate Period (*c.* 2300–*c.* 1900 BC) and the Middle Bronze Age (*c.* 1900–*c.* 1525 BC): revival of trade and connecting link between the greater states; *e.g.*, Aleppo, Byblos, Alalakh in Syria
 - i. The Amorite invasion: breakup of settled areas by nomadic peoples, bronze weapons and votive objects
 - ii. Reappearance of urban civilization in the Middle Bronze Age: hieroglyphics, clay tablets, development of new pottery in Canaan
 - 2. Emergence of civilizations in Anatolia, Cyprus, and the Aegean
 - a. Anatolia: the Neolithic, Chalcolithic, and Bronze ages; settlement by the Hittites
 - i. Neolithic farming communities: house styles, tools and weapons, pottery, foodstuffs
 - ii. Appearance of painted pottery in the Chalcolithic Period, uses of metal
 - iii. Bronze Age culture; *e.g.*, Troy, Alaca Hüyük: jewelry, pottery, burial customs, metalworking, weaponry, migrations
 - iv. The Hittite occupation of Anatolia and establishment of the Old Hittite Kingdom (*c.* 1700–*c.* 1500 BC): expansion into northern Mesopotamia and Syria under Hattusilis and Mursilis, the Hurrian invasions, the Middle Kingdom
 - b. The Late Neolithic, Chalcolithic, and Bronze ages in Cyprus
 - c. The early Aegean civilizations (to *c.* 1450 BC)
 - i. The Paleolithic, Neolithic, and Chalcolithic ages in Greece, Crete, and the Aegean islands; the pre-Greek (Early Bronze or Helladic) population of Greece from *c.* 3000 BC; the Early Bronze or Cycladic Age in the Aegean islands; the shaft grave period on the mainland
 - ii. The Minoan civilization on Crete: the period of the Early Palaces (*c.* 2200–1700 BC), cultural efflorescence, Kamáres ware, commerce, Knossos, Middle Cycladic culture, period of the Later Palaces (*c.* 1700–*c.* 1450 BC) on Crete, the arts, Linear A tablets
- E. The era of the Egyptian and Hittite empires (*c.* 1600–1050 BC): the expansion of the Indo-Europeans
- 1. The New Kingdom of Egypt (18th–20th dynasties, 1539–1075 BC)
 - a. The 18th dynasty (1539–1292 BC): the emergence of strong centralized administration, territorial expansion, religious and cultural developments
 - i. Expulsion of the Hyksos from Egypt under Ahmose (1539–1514 BC): cult of Amon-Re, expansion into Syria and Palestine, contacts with the Aegean and its arts
 - ii. Egyptian culture and prosperity in the reigns of Amenhotep III (1390–1353 BC) and Akhenaton (Amenhotep IV; 1353–1336 BC): domination over Nubia, erection of new temples at Thebes, cult of the god Aton, subsequent eclipse of the dynasty
 - b. The 19th and 20th dynasties (1292–1075 BC): political shift to the north, new construction, foreign policies
 - i. Reassertion of Egyptian power: campaigns against the Hittites and Libyans, succession disputes
 - ii. The reign of Ramses III (1187–1156 BC) and subsequent decline of the 20th dynasty, campaigns against the Sea Peoples, growth of influence of the priests of Amon-Re
 - c. Society and culture in the New Kingdom: the king as the embodiment of the state; the civil service; the military; the priesthood; the artisans, common people, and slaves; trade and commerce
 - 2. The Hittite Empire and its conflict with Egypt; Syria and Palestine under Egyptian and Hittite domination; the period of the migrations of new peoples
 - a. The Hittite Empire (*c.* 1525–1190 BC)
 - i. Expansion of the Hittite Empire under Suppiluliumas I into Syria (*c.* 1365 BC): reduction of the Mitannian state, ensuing conflicts and treaties with Egypt, relations with neighbouring states

- ii. The capital of the Hittite Empire at Hattusa (Boğazköy): geographical position, architecture, invasions from the West, fall of the empire and destruction of the capital (c. 1190 BC), emergence of the Indo-European Phrygians as the chief Anatolian power
- b. Syria and Palestine under Egyptian, Mitannian, and Hittite domination, and the period of the migrations of new peoples (c. 1550–1200 BC)
 - i. The development of Levantine seafaring trade: the Levantine city-states (e.g., Ugarit), political organization, economy, culture, development of the linear alphabet by the Canaanites and the spread of its use
 - ii. The origins of the Hebrews in the patriarchal age and their sojourn in and Exodus from Egypt in the 13th century BC, their conquest of Palestine, the Sea Peoples and the Philistine conquest of the Palestinian littoral
 - iii. The Syro-Hittite states and the migration of the Semitic Aramaeans into Syria and Palestine c. 1100 BC and their foundation of states in Syria: spread of the Aramaic language, trends in religion and the arts
- 3. Mesopotamia from c. 1600 to c. 900 BC
 - a. The Kassites in Babylonia (c. 1595–c. 1155 BC): their conjectured origins, their adoption of Mesopotamian culture, Elamite and Assyrian invasions after c. 1250, the fall of the Kassites
 - b. The kingdom of the Hurrians and the Mitanni (c. 1500–1360 BC) in northern Mesopotamia, its displacement by Assyria
 - c. The rise of Assyria (c. 1360–1076 BC): expansion under Ashur-uballit I (c. 1365–c. 1330 BC), conquest of Babylon, continued expansion to Tiglath-pileser I (c. 1115–c. 1077 BC), temporary eclipse of Assyria (to c. 900 BC)
- 4. The Elamite kingdom and its struggle with Babylonia in the 13th and 12th centuries BC
- 5. Mycenaean (Achaean, Late Helladic) civilization in Greece (c. 1450–1100 BC): the eruption of Thera (c. 1500 BC), the conquest of Minoan Crete (c. 1450 BC), and the arrival of the Greeks
 - a. The overthrow of the existing social order, introduction of new artistic styles, conquest of the Cyclades, the evidence of the Linear B tablets, destruction of the palace at Knossos and period of the Mycenaean Empire
 - b. The end of the Bronze Age in the Aegean: destruction of Mycenaean centres, invasion from the north and the coming of the Greeks
 - c. The people of the Bronze Age Aegean: physical types, dress, society, economy, warfare, religion, and arts
- F. The era of the new states of Southwest Asia: the beginning of the Iron Age (c. 1050–700 BC)
 - 1. Egypt and Babylonia in decline, further Assyrian expansion
 - a. Egypt under the 21st–25th dynasties (c. 1075–656 BC): loss of influence in Syria, disunity and the diminution of royal power, Libyan domination, civil war and Kushite (Ethiopian) rule, the Assyrian conquest (671–664 BC)
 - b. Babylonia (c. 1050–750 BC): the brief resurgence of Babylonian power under Nebuchadnezzar I (1124–1103 BC); the cult of Marduk; Aramaean, Assyrian, and Chaldean invasions from the 11th to the 9th century BC
 - c. Emergence of Assyria as the dominant Mesopotamian state after c. 900 BC: internal dissension and the challenge of Urartu in the 8th century BC
 - 2. Palestine, Syria, Anatolia, and Iran
 - a. Development of Canaanite–Phoenician commercial city-states from c. 1100 to c. 700 BC (e.g., Tyre, Sidon): trade and colonization, Phoenician civilization
 - b. The Hebrew kingdom (c. 1020–c. 700 BC): subjection of the Philistines, territorial expansion in Syria and Palestine
 - i. The reigns of David and Solomon in the 10th century, growth of separate kingdoms of Judah (south) and Israel (north, conquered by Assyria in 722 BC)
 - ii. The cult of Yahweh and biblical literature, social and political structure, arts
 - c. The neo-Hittite states of southeastern Anatolia: Carchemish, Milid (Malatya), Tabal, and Que (c. 1180–700 BC); conquest by the Aramaeans and Assyrians
 - d. Foundation of Urartu in about the 13th century BC, rise of the Urartian kingdom (c. 840–c. 744 BC), Assyrian influences, the Cimmerian invasion (c. 714 BC) and destruction of the kingdom (c. 609 BC), influence of the Urartian state, the Armenian Empire under the Artaxiads

- e. Phrygia in central and western Anatolia (*c.* 1180–*c.* 700 BC): capital at Gordium, relations with Assyrians and Luwians, the Cimmerian invasions in the beginning of the 7th century, the cult of Cybele
 - f. The Aramaean kingdoms (*e.g.*, Damascus) and their cultural and commercial role: conquest by Assyria
 - g. The Neo-Elamite period: the occupation of Iran by the Indo-European Medes and Persians by the 9th century BC
- G. The era of the Assyrian and Neo-Babylonian empires and the Achaemenid Persian Empire (746–250 BC)
- 1. The first imperial unification of the ancient Near East under the Assyrian Empire (746–609 BC)
 - a. Assyrian culture in the context of the Mesopotamian tradition: the great cities; *e.g.*, Nineveh
 - b. Expansion of the empire under Tiglath-pileser III (744–727 BC), Sargon II (721–705 BC), and Sennacherib (704–681 BC); decline from the reign of Ashurbanipal (668–627 BC); conquest by the Medes (625–609 BC)
 - 2. The interval between Assyrian and Achaemenid hegemony (610–539 BC)
 - a. The Neo-Babylonian Empire (636–539 BC): conquests, treatment of Jews, decline of the empire
 - i. The reign of Nebuchadnezzar II (604–562 BC): subjection of Syria and Palestine, the Babylonian Exile of the Jews and the post-Exile period, building activities
 - ii. The last kings of Babylonia: internal dissension and early relations with Persia, surrender to Cyrus II the Great (539 BC)
 - b. The Anatolian kingdom of Lydia (*c.* 700–*c.* 547 BC): early relations with Assyria, the Cimmerian invasions, suzerainty over the Greeks in Anatolia, Greco-Lydia culture, growth of independent Cilicia in the late 7th century, conquest by Persia
 - c. Saite Egypt (26th dynasty, 664–525 BC) and its reassertion of independence after Assyrian rule; revival of traditional Egyptian culture, subjection to Persia
 - d. The Kingdom of the Medes in Iran (*c.* 700–550 BC) and the establishment of the Achaemenid Persian Empire
 - i. Conjectured origins of the Median state, expulsion of the Scythians, extension of control over the other Iranian peoples and into Armenia and eastern Anatolia after the downfall of Assyria
 - ii. Cyrus II the Great's (550–529 BC) establishment of his rule from Anatolia to east of Iran, relative generosity toward subject peoples
 - 3. The Achaemenid Persian Empire (529–330 BC) under the successors of Cyrus II the Great, Greek rule to *c.* 250 BC
 - a. The empire under Cambyses II, Darius I, and Xerxes I (529–465 BC): the subjugation of Egypt, establishment of peace in the empire, penetration of the Balkan Peninsula and the unsuccessful attempts to conquer mainland Greece
 - b. Xerxes' weak successors: continued involvement in Greek affairs; internal disunity in the 4th century, resulting in conquest by Alexander III the Great (330 BC)
 - c. Achaemenid society and culture: Zoroastrianism, Persepolis and other capitals, social structure and economy
 - d. Seleucid rule to *c.* 250 BC, movement of Iranian peoples, revolt of the high satrapies
- H. The Parthian and Sāsānian empires (*c.* 250 BC–AD 651), Armenia
- 1. The revival of Iranian power with the establishment of the Parthian Empire by Arsaces, formation of the Arsacid Parthian state
 - a. The "Philhellenistic Period" (*c.* 171 BC–*c.* AD 10): eastern and western expansion until the mid-1st century BC, wars with Rome until the settlement of 20 BC
 - b. The "Anti-Hellenistic Period" (AD 2–162): Parthian government under Artabanus III (AD 12–38), dissolution of the Parthian state
 - c. Roman invasions and the end of the Parthian Empire (AD 162–226)
 - 2. Extension of Iranian power under the Sāsānian Empire
 - a. Foundation of the empire: the rise of Ardashir I in the early 3rd century AD, the wars of Shāpūr I (AD 241–272), organization of the empire

- b. Religious developments: Zoroastrianism, Christianity, Manichaeism; art and literature
 - c. Foreign policy: conflicts with the Romans, Byzantines, and Turks under Khosrow I (AD 531–579) and Khosrow II (AD 590/591–628); subsequent decline and extinction of the empire with the Arab conquest (AD 636/637–651)
- 3. Armenia: client status under the Iranian empires of Rome in the period dominated by the Arsacids
- I. The Nilotic Sudan, South Arabia, and Ethiopia until *c.* AD 600; North Africa until the Roman conquest (from 146 BC)
 - 1. Emergence of civilization in the Nilotic Sudan (Nubia): the origins of Nubian culture
 - 2. Egyptianization and the Kingdom of Kush (*c.* 1786–751 BC), conquest of Egypt (*c.* 730 BC) and later expulsion by the Assyrians (by 654 BC), conquest by Aksum (AD 350)
 - 3. Pre-Islāmic South Arabia: the kingdoms of Ma'in, Saba', Qatabān, Ḥaḍramawt, and the tribes of central and northern Arabia; economic activities; religion; foreign relations
 - 4. Ethiopia to *c.* AD 650
 - a. Remotest antiquity: the land of Punt, the Sabaeen period
 - b. The Aksumite Empire (2nd century AD): the Abyssinian peoples, maritime trade, Ezana's rule (4th century AD), reign of Ella-Asbeha (6th century AD) and relations with Persia
 - 5. North Africa until the Roman conquest
 - a. Emergence of civilization in North Africa: the Early Neolithic culture in the Maghrib and Libya, the Berbers, the influence of Egypt, the advent of the mercantile Phoenicians and their foundation of Carthage *c.* 814 BC (Utica, 1101 BC?), the Greeks in Cyrenaica from *c.* 630 BC
 - b. Emergence of Carthage as the leading western Mediterranean power: conflicts with the Greeks in the western Mediterranean, extension of Carthaginian power into Spain and the clash with Rome in the Punic Wars resulting in the destruction of Carthage (146 BC)
 - c. Roman penetration into North Africa: the native kingdoms of Numidia and Mauretania and their eventual incorporation into the Roman Empire

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with early peoples and civilizations of Southwest Asia and Egypt, the Aegean, and North Africa

Afghanistan	Israel	North Africa	Transcaucasia
Arabia	Jordan	Palestine	Turkey and
Egypt	Lebanon	Prehistoric Peoples	Ancient Anatolia
Greek and Roman	Mesopotamia,	and Cultures	
Civilizations,	The History of	Syria	
Ancient	Ancient		
Iran			

MICROPAEDIA: Selected entries of reference information

General subjects

<i>Anatolia, Cyprus, and the Aegean:</i>	Harran	Paphlagonia	Ḥimyar
Aegean civilizations	Hittite	Perga	Kindah
Ahhiyawa	Karatepe	Phocaea	Nabataean
Alaca Hüyük	Kaska	Phrygia	Saba'
Alişar Hüyük	Kizzuwadna	Pisidia	Şaliḥ
Amathus	Knossos	Sakcagöz	Tanūkh
Anatolia	Kültepe	Salamis	Thamūd
Arzawa	Luwian	Sardis	<i>Egypt:</i>
Aspendus	Lycaonia	Soli	Abū Jirāb
Bithynia	Lycia	Tarsus	Abū Ruwaysh
Boğazköy	Lydia	Troas	Abu Simbel
Çatalhöyük	Milid	Troy	Amarna, Tell el-
Chalcedon	Minoan	Xanthus	Amratian culture
Cilicia	civilization	Yazılıkaya	Badarian culture
Citium	Muşaşir	Zincirli Höyük	Beni Hasan
Gordium	Mysia	<i>Arabia:</i>	Canopus
	Pamphylia	Arabia Felix	

Dahshūr	Babylon	Parthia	Dibon
Dayr al-Baḥrī	Babylonia	Pasargadae	Ebla
Dayr al-Madinah	Birāk, Tall	Persepolis	Edom
Elephantine	Borsippa	Persis	Far'ah, Tall al-
Gerzean culture	Calah	Satrap	Fārī'ah, Tall al-
Giza, Pyramids of	Chaldea	Shahr-e Sokhta	Galilee
Hermopolis Magna	Ctesiphon	Shuruppak	Gath
Hierakonpolis	Cunaxa, Battle of	Sippar	Gezer
Hyksos	Dur Sharrukin	Sumer	Ghassulian culture
Kadesh, Battle of	Elam	Susa	Gibeon
Kahun	Erech	Teishebaini	Gilead
Karnak	Eridu	Ten Thousand	Ḥalaf, Tall
Kawa	Eshnunna	Immortals	Ḥasi, Tel
Kings, Valley	Fertile Crescent	Tepe Gawra	Hebrew
of the	Gaugamela,	Tepe Yahya	Hierapolis
Lāhūn, al-	Battle of	Toprakkale	Jericho
Luxor	Granicus, Battle	ʿUbayd, Tall al-	Jezreel
Ma'ādī, al-	of the	Ur	Judaea
Madīnat Habu	Guti	Urartu	Judah
Maydūm	Hammurabi,	<i>North Africa:</i>	Kadesh
Memphis	Code of	Caspian industry	Kadesh, Battle of
Naukratis	Hasanlu	Carthage	Karkar
nome	Hassuna	Cyrenaica	Katna
Oxyrhynchus	Hatra	Fezzan	Kiriath-sepher
Palermo Stone	Ḥirah, al-	Gaetulia	Mari
Pelusium	Hurrian	Hadrumetum	Megiddo
Per Ramessu	Isin	Hippo	Nora
pharaoh	Jazīrah, al-	Lambessa	Palestine
Ramesseum	Kassite	Leptis	Palmyra
Sais	Khwarezm	Mauretania	Philistine
Ṣaqqārah	Kish	Numidia	Phoenicia
Sarapeum	kudurru	Ptolemais	Samaria
Tanis	Lagash	Sabratha	Shubāt Enlil
Tasian culture	Larsa	Thugga	Ugarit
Thebes	Lullubi	Tripolitania	<i>other:</i>
Turin Papyrus	Mannai	Utica	Aksum
<i>Mesopotamia and</i>	Media	Volubilis	Meroe
<i>Iran:</i>	Mesene	<i>Palestine and Syria:</i>	Mycenae
Adab	Mesopotamia	Ai	Napata
Akhlahme	Mitanni	ʿAjjul, Tall al-	Nubia
Akkad	Nineveh	Alalakh	Ophir
Amorite	Nippur	Aleppo	Pelasgi
Anbar	Nisa	Bashan	Punt
Anshan	Nuzu	Beth Yerah	Sea People
Ashur	Osroëne	Canaan	tell
Assyria	Parni	Carchemish	

Biographies*Egypt:*

Akhenaton
Amenhotep III
Ankhesenamen
Hatshepsut
Mentuhotep II
Merneptah
Ramses II
Ramses III
Ramses IV
Saite dynasty
Sesostris I
Sesostris III
Seti I

Snefru

Thutmose I
Thutmose III
Thutmose IV
Tutankhamen

Israel:

Abraham
David
Moses
Solomon

Mesopotamia

(*Akkad, Assyria,*
Babylonia):
Ashurbanipal

Ashurnarsipal II

Esarhaddon
Hammurabi
Merodach-Baladan II
Nebuchadnezzar II
Sargon
Sargon II
Sennacherib
Tiglath-pileser III

Persia (Iran):

Achaemenian
dynasty
Arsacid dynasty
Artaxerxes II

Cambyses II

Cyrus II
Darius II
Khosrow I
Khosrow II
Sāsānian dynasty
Shāpūr II
Xerxes I

other:

Hannibal
Suppiluliumas I
Tigranes II the
Great

Section 912. Peoples of Ancient Europe and the Classical Civilizations of the Ancient Mediterranean World to AD 395

A. Non-Classical ancient Europe

1. The geography and ethnography of Europe, archaeological and documentary historical sources, historiographic problems
2. Europe before the Iron Age
 - a. Spread of Neolithic farming communities throughout all of Europe by *c.* 2000 BC
 - b. Spread of Bronze Age industry throughout Europe by *c.* 1500 BC; population movements into southeastern Europe and southwestern Asia in the 2nd millennium BC, the Indo-Europeans
3. Non-Classical Europe in the Iron Age (*c.* 650 BC–*c.* AD 100)
 - a. The Etruscans and other Italic peoples, the non-Greek peoples of the Balkan Peninsula
 - i. Conjectured Etruscan origins; Etruscan language and writing; cities; government and society; art and religion; maritime expansion; foreign relations with the Greeks, Carthaginians, and other Italic peoples; decline after *c.* 500 BC and eventual Roman conquest in the mid-3rd century
 - ii. Other Italic peoples: the Umbro-Sabellians, Oscans, Apulians, Latins, Siculi, Ligurians, Veneti, and Piceni; their cultures; their relations with the Greeks, Etruscans, and Carthaginians; eventual absorption by Rome
 - iii. Non-Greek peoples of the Balkan Peninsula; *e.g.*, Illyrians, Thracians: their culture and relationship to Classical civilizations
 - b. Trans-Alpine Europe and the Iberian Peninsula
 - i. The Celts: the Hallstatt Period (7th–6th centuries BC); Celtic occupation of Europe from the Danube to the Iberian Peninsula and the British Isles by *c.* 500 BC; Celtic penetration of Italy, the Balkan Peninsula, and Anatolia during the La Tène period (after *c.* 500 BC); subjugation in Gaul by Rome by 50 BC and later by the Germans by the 5th century AD; Celtic art, religion, and social and political organization
 - ii. The Germans: their acquisition of Iron Age culture, migration into the Elbe–Rhine region by *c.* 500 BC, pressure on the Celts and Rome, inundation of the western half of the Roman Empire by the 5th century AD, Germanic social and political organization, religion and mythology
 - c. Ancient peoples of the European steppe
 - i. The Cimmerians: conjectured origins; southward migration, under Scythian pressure, from north of the Caucasus into Southwest Asia in the 8th and 7th centuries BC
 - ii. The Scythians (Sakas): westward migration from the 8th century BC and eventual establishment in India and southern Russia after *c.* 600 BC; the Kingdom of the Royal Scyths in southern Russia from *c.* 600 BC to *c.* AD 100; relations with the Greeks and with Achaemenid Persia; government, society, and military tactics; art and religion
 - iii. The Sarmatian migration into southern Russia in the 4th century BC and gradual displacement of the Scythians by *c.* AD 100; conflict with Rome; conquest by the Goths and Huns in the 3rd and 4th centuries AD; society, art, and religion

B. Archaic Greece and the development of Classical Greek civilization (*c.* 1200–323 BC)

1. The Early Archaic and Archaic periods (*c.* 1200–*c.* 500 BC)
 - a. The Dorian invasions, the Greek migrations to Anatolia, and their results (Proto-Geometric Period, *c.* 1100–*c.* 900 BC)
 - b. The Geometric Period (*c.* 900–*c.* 750 BC): the world of Homer and Hesiod, the beginning of writing and of the *polis*, mythology and religious developments, the panhellenic centres (*e.g.*, Olympia, Delphi), social and political organization
 - c. The Archaic Period (*c.* 750–*c.* 500 BC)
 - i. General trends in the *poleis*: displacement of monarchy by aristocracy, development of a money economy, socioeconomic crises and the rise and fall of tyranny, the colonization movement, relations among the *poleis* (*e.g.*, leagues, wars)

- ii. The *poleis* of mainland Greece: the emergence of Spartan dominance over the Peloponnese and of a military-oriented polity and repression; aristocracy and tyranny at Athens, the reforms of Solon, and the institution of democracy under Cleisthenes; tyranny, aristocracy, and economic expansion at Corinth; the other *poleis* of the Peloponnese, the Isthmus, Euboea, and Boeotia
 - iii. The Greeks in Asia Minor (Anatolia): Dorian and Aeolian cities; Miletus, Ephesus, and other Ionian cities; their commercial and cultural efflorescence
 - iv. The Greek islands: the Cyclades, Sporades, Crete, Cyprus, and the Ionian Islands
 - v. The Greek colonies and emporia in the West and Africa: southern Italy and Sicily (*e.g.*, Cumae, Syracuse), Gaul and the Iberian Peninsula (*e.g.*, Massilia), Cyrene and Naukratis
 - vi. The Greeks in the North: Chalcidice, Thrace, Propontis (*e.g.*, Byzantium, Abydos, Lampsacus), and Pontus (*e.g.*, Black Sea region, Sinope, and Trapezus)
 - vii. The arts in the Archaic Period; rationalism and irrationalism and the beginnings of philosophy and science, Orphism and the cult of Dionysus
 - viii. The Greco-Persian Wars: the Persian (Achaemenid) conquest of Asia Minor and Thrace and the Ionian revolt (499 BC), Darius' (490 BC) and Xerxes' (480 BC) invasions of Greece and eventual Greek victory, the Greek offensive (479 BC), results of the wars, Herodotus' account of the conflict
2. The Classical period (c. 500–323 BC)
- a. Athens in the age of Pericles
 - i. The Delian League and the Athenian Empire
 - ii. Temporary retardation and final development of the democracy, society and economy
 - iii. Cultural efflorescence; *e.g.*, the rebuilding of the Acropolis, drama, the pre-Socratic philosophers
 - b. The Peloponnesian League and the other Greek states in the 5th century BC: relations among the Greek states from 479 to 431 BC
 - c. The Peloponnesian War (431–404 BC): the war to the Peace of Nicias (421), renewal of the war and the defeat of Athens, intellectual and political changes at Athens (*e.g.*, oligarchic revolution, the Sophists and Socrates), Thucydides' account of the war
 - d. The era of the Spartan and Theban hegemonies in Greece: Spartan policies toward the Greek states, relations with Persia, Athens and Thebes against Sparta, the Second Athenian League and the restoration of democracy, Theban expansion and containment, peace and the balance of power in Greece
 - e. The northern kingdoms: Epirus, the rise of Macedonia and the conquest of Greece under Philip II
 - f. The western Greeks: conflict with Carthage, the rise of Syracuse under Dionysius the Elder
 - g. Greek culture in the 4th century BC: developments in philosophy and the arts
 - h. The empire of Alexander III the Great: relations with the Greeks; the conquest of the Persian Empire (334–330 BC), Bactria, and the Indus Valley (330–323 BC); the ideals and governing practices of Alexander and the diversity of his empire
- C. The Hellenistic Age (323–27 BC)
- 1. Establishment of the Hellenistic kingdoms and monarchies
 - a. The regency and warfare among rival generals after Alexander's death (323–276 BC)
 - b. Macedonian and Ptolemaic Egypt (323–30 BC)
 - i. The Ptolemaic dynasty: dynastic strife and the end of the dynasty with the death of Cleopatra (30 BC)
 - ii. Government and civilization of Hellenistic Egypt
 - c. The Seleucid Kingdom in Asia: the dynasty, government, society, culture, and economy in its diverse regions; Jewish resistance; territorial losses in the 3rd century
 - d. Greek rule in Bactria and India
 - e. The Attalid kingdom of Pergamum and the native states in Asia Minor: Bithynia, Pontus, Cappadocia, Galatia, and Rhodes
 - f. The Antigonid kingdom of Macedonia: government and foreign policy

- g. Greece: social and political changes in the *polis*, the Achaean and Aetolian leagues, Athens and the other Greek states
- h. The western Greeks, Epirus, Sicily under Agathocles (317–289 BC) and Hieron II (c. 270–216/215 BC) until its absorption by Rome
- 2. Relations among the Hellenistic states and other peoples from c. 275 to 27 BC
 - a. Expansionist policies of the Ptolemies in the Aegean and Asia Minor and Syria and their conflicts with the Seleucids
 - b. Conflicts between the Greek leagues and the Antigonids in the 3rd century BC
 - c. The Celtic migrations: expansion into the Iberian Peninsula, the British Isles, and Rome and southern Italy; later expansion into central Europe, the Carpathians, and the Balkans
 - d. The vigorous policies of Antiochus III and Philip V; the breakup of the Seleucid Empire; the entrance of Rome into the affairs of the Hellenistic states, resulting in their eventual incorporation into the Roman Empire
- 3. Hellenistic political, social, economic, and cultural institutions
 - a. Hellenistic monarchy and royal administration
 - b. Cultural developments: developments in philosophy, science, the arts, education, and religion

D. The rise of Rome

- 1. The character and achievements of the Romans, the archaeological and documentary historical sources (e.g., Pompeii and Herculaneum), historiographic problems
- 2. Early (regal) Rome to the 6th century BC
 - a. Myths of origins and the early monarchy
 - b. The Etruscan hegemony and formative influence over Rome
 - c. Development of Roman social, religious, political, and military institutions; Roman virtues
- 3. The early Roman Republic (6th century–264 BC)
 - a. Overthrow of the monarchy and establishment of the republic and its institutions: the magistracies, judicial institutions, the Senate, plebeian institutions
 - b. Expansion of Rome in Italy: Rome and its Latin neighbours, the Gallic invasion and further conquests, Roman mastery of Italy
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 - i. The First Punic War (264–241 BC) and its aftermath: the emergence of Roman naval power and acquisition of Sicily (241 BC), later annexation of Corsica and Sardinia (238 BC)
 - ii. Roman expansion into Cisalpine Gaul and entry into Greek affairs
 - iii. The Second Punic War (218–201 BC): Hannibal's invasion of Italy, his initial victories, and the war of attrition in Italy; Roman defeat of the Carthaginians at the Battle of the Metaurus (207 BC); the First Macedonian War (214–205 BC) and the conflict in Spain; Roman counteroffensive and victory in Africa (202 BC); Roman pacification of conquered territories
 - b. Establishment of Roman hegemony in the Hellenistic world
 - i. Establishment of a Roman protectorate over Greece after the Second Macedonian War (200–196 BC), the conquest of Macedonia and Illyricum (168 BC), the reduction of Rhodes, Roman exclusion of Seleucid power from the Aegean
 - ii. The Third Punic War (149–146 BC): the destruction of Carthage, subjugation of Macedonia and Greece
 - iii. Beginning of Roman provincial administration, abuses, Romanization of the empire
 - c. Roman government and economy in the middle republic: consuls, the Senate, and popular assemblies; development of large business interests, grazing estates, and urban immigration
 - d. Roman culture in the middle republic: Hellenizing influences
- 5. The late Roman Republic (133–31 BC)
 - a. Social and economic ills in Italy and the reform movement of the Gracchi (133–121 BC) and its results: the rise of middle-class equites

- b. Roman wars against the Celts and the conquest of Gallia Narbonensis (121 BC), wars against Jugurtha of Numidia (112–105 BC) and the Germans (105–101 BC), Marius' career and military reforms
 - c. Events in Asia and the first war with Mithradates VI Eupator (88–85 BC); Italian allies (*socii*) against Rome in the Social War (90–89 BC) and their subsequent enfranchisement, the dictatorship and constitution of Sulla (82–80 BC)
 - d. The Roman state in the two decades after Sulla
 - i. Pompey's early career, revolts against Roman rule, Pompey's alliance with Crassus and repeal of the Sullan system, his extraordinary commands
 - ii. Growing political suspicion and the outbreak of violence in the mid-1st century BC: the conspiracies of Catiline, Cicero's decline, the rise of Caesar and Pompey
 - e. The alliance of Caesar, Pompey, and Crassus (59–44 BC); Caesar's conquest of Gaul; political maneuvers and the outbreak of the Civil War; Caesar's triumph, dictatorship, and assassination
 - f. The initial cooperation of Octavian and Mark Antony in the Triumvirate and Octavian's achievement of sole power (43–31 BC); the annexation of Egypt and its administration
 - g. Roman law during the late republic: the development of new procedures, the role of magistrates, the law of succession
 - h. Culture in the late republic: oratory and philosophy, the arts
- E. The Roman Empire (31 BC–AD 395)
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 - a. Augustus' establishment of the principate (27 BC–AD 14): the role of the *princeps*; the imperial administration, fiscal and military reforms, and the founding of new colonies; social and religious legislation; economic growth
 - b. The Roman Empire at the time of Augustus: provincial administration, the imperial frontiers, the western provinces, the eastern provinces, the economic unification of the Mediterranean
 - c. Foreign policy: Roman relations with Parthia and the other states in the East; the southern, western, and northern frontiers
 - d. The culture of the Augustan Age: contributions of Livy, Virgil, Horace, and Ovid; religion; the visual arts
 - e. The empire under Tiberius (AD 14–37), Caligula (AD 37–41), Claudius I (AD 41–54), and Nero (AD 54–68): internal and frontier policies, the annexation of Britain, Tacitus' accounts, civil war and revolt in "the year of the four Emperors" (AD 69)
 2. Growth of the empire under the Flavians and Antonines (AD 69–192)
 - a. The Flavian emperors (AD 69–96): Vespasian's fiscal and provincial reorganization, military and frontier policies, Titus and the suppression of the Jewish revolt, Domitian's despotism, military development and frontiers
 - b. The Antonine emperors (AD 96–192): the reigns of Nerva, Trajan, Hadrian, Antoninus Pius, Marcus Aurelius, and Commodus; the beginning of imperial decline after AD 180
 3. The zenith of the Roman Empire in the late 1st and 2nd centuries AD
 - a. The city of Rome and the empire: methods of Roman imperialism; the cities, culture, society, politics, and economy of the western and eastern provinces; the legions and frontier defenses
 - b. Greco-Roman culture of the late 1st and 2nd centuries AD: developments in philosophy, religion, technology, and the arts
 4. Changes and crises in the Roman Empire in the 3rd and 4th centuries AD
 - a. Civil wars, conflict with Parthia, the growth of bureaucracy, and militarization of government under the Severan dynasty (AD 193–235)
 - b. Religious and cultural life: the public religions under the empire, the rise and spread of Christianity and other Eastern religions, official persecution of Christianity
 - c. The transformation of Greco-Roman culture in late antiquity (3rd and 4th centuries AD), Greek revival and growth of Christian theology
 - d. Military anarchy and disintegration of the Roman Empire (AD 235–270): the Gordians, the beginning of Germanic invasions, loss of eastern provinces, economic and social crisis

- e. The recovery of the Roman Empire and the establishment of the dominate (AD 270–337): the recovery measures of Aurelian and his immediate successors
 - i. Diocletian's (284–305) fundamental political and economic measures: persecution of Christians, struggle for power
 - ii. Constantine the Great (307–337) and his conversion to Christianity, administration, and founding of Constantinople
- f. The Roman Empire under the 4th-century successors of Constantine to Theodosius I (AD 379–395)
 - i. The rule of Constantine's sons (337–361): renewed wars with Sāsānid Persia and increased penetration of the empire by the Germans
 - ii. Julian's reign (361–363): the attempt to restore the old empire
 - iii. Establishment of Christianity as the sole state religion; social, economic, and urban decline; remnants of pagan culture
- g. The provinces under the later empire and the eclipse of the empire in the West: Germanic hegemony and the invasions by other peoples

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with peoples of ancient Europe and the Classical civilizations of the ancient Mediterranean world to AD 395

Alexander the Great	Caesar	France	Greek and Roman Civilizations, Ancient
Athens	Constantine the Great	Germany	
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Division II. Peoples and Civilizations of Medieval Europe, North Africa, and Southwest Asia

[For Part Nine headnote see page 343.]

The outlines in the four sections of Division II deal with the civilizations directly descendant from those of the ancient Near East and of Classical antiquity, which are treated in the two sections of Division I. The general period covered in Division II is the Middle Ages, beginning with the death of Theodosius I in AD 395, conventionally taken as marking the permanent division of the Roman Empire into East and West, and extending to *c.* 1500, conventionally taken as the starting point of modern history.

The sectional organization of this division and the outlines in its four sections reflect significant cultural and political interaction between the Eastern Christian, Western Christian, and Islāmic spheres, and also involve some breaking points in the history of each sphere.

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922. The Formative Period in Islāmic History, from AD 622 to *c.* 1055 361

923. Western Christendom in the High and Later Middle Ages (*c.* 1050–*c.* 1500) 363

924. The Crusading Movement, the Islāmic States of Southwest Asia, North Africa, and Europe, and the States of Eastern Christendom from *c.* 1050 to *c.* 1480 372

Section 921. Western Europe, the Byzantine (Eastern Roman) Empire, and Eastern Europe from AD 395 to *c.* 1050

- A. The study of medieval and Byzantine history: the historical sources, historiographic problems, chronological outline
- B. The eclipse of the Roman Empire in the West and the development and Christianization of Germanic successor states (AD 395–*c.* 750)
 1. The end of the Western Roman Empire and the Germanic Völkerwanderung (AD 395–*c.* 500)
 - a. The general decline of government, economy, society, and culture
 - b. Establishment of the Germanic hegemony: the invasions of Vandals; the invasions of Angles, Saxons, and Jutes (Britain); the Visigothic invasions in the 5th century and settlement in Provence and Spain; the Frankish conquest of Gaul (*c.* 481/482–511) and the Burgundian flight to the south; the Huns; abolition of the Western Empire and Ostrogothic rule in Italy (493–553); other Germanic tribes—the issue of Arianism versus Catholic Christianity; Germanic law and society

2. The Germanic successor states and the remnants of the Roman Empire in the West from c. 500 to 750; the origins of early feudalism
 - a. Byzantine conquests and later diminution of Byzantium's western possessions (540–751), the Exarchate of Ravenna, Lombard conquests in Italy, beginning of the political role of the Roman papacy
 - b. Early development of the Germanic kingdoms
 - i. The Visigothic kingdom to 711
 - ii. The Anglo-Saxon kingdoms in England and the Celtic kingdoms in Ireland
 - iii. The Franks under the Merovingians and early Carolingians: the successors of Clovis, rise and establishment of the Carolingians under Charles Martel and Pepin III the Short (714–768), Carolingian relations with the papacy and entry into Italian affairs; origins of the Papal States
 - c. Effects of the rise of Islām on western Europe
 3. Religion, the arts, and society in the early Middle Ages: the amalgamation of late Classical and Germanic cultures and Christianity
 - a. Conversion of the Celts, the Picts, and the Germans to Catholic Christianity: religious and cultural functions of monasticism and the Western Church
 - b. The arts, intellectual life, and education in the early Middle Ages
 - c. Social and economic life in the early Middle Ages
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 2. Persistence of Greco-Roman society in the East in the 5th century: the empire from the death of Theodosius I to the accession of Heraclius (610)
 - a. Economic and social policies: agriculture, coinage, relations with the barbarians (*e.g.*, Huns, Goths, Isaurians, Avars, Slavs)
 - b. Ecclesiastical controversies, Syrian and Egyptian disaffection, and the beginning of conflict with the Western Church
 - c. The empire at the end of the 5th century: internal tensions, political and economic policies under Anastasius I
 - d. The reigns of Justin I (518–527) and Justinian I (527–565): realignment with the Roman Church, Code of Justinian, military campaigns in the West, effects of the plague, later campaigns
 - e. Early Byzantine culture: Christianity, the arts, and intellectual life
 - f. Justinian's successors (565–610): relations with the barbarians and with the Persians, revolt of the army
 3. Rehabilitation of the empire under the dynasty of Heraclius (610–711)
 - a. Heraclius' reorganization of the empire along military lines: wars with Persia; the loss of Syria, Palestine, Armenia, and Egypt to the Arabs and continued Arab pressures; recognition of Byzantine overlordship in the Balkans
 - b. Decline of the dynasty (685–711): renewed wars with the Slavs; settlement with the Arabs; fiscal, agricultural, and defensive policies; military anarchy (711–717)
- D. Western Christendom and Scandinavia from the Carolingian era to the general European revival (c. 750–c. 1050)
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 - a. The reign of Charlemagne (king, 768–814; emperor from 800): further military expansion of the Frankish kingdom; legislation, administration, and defense; ecclesiastical policies; patronage of arts and learning
 - b. Decline and dissolution of the Carolingian Empire under the successors of Charlemagne: the society, government, and culture of the Frankish world
 - i. Louis the Pious; partitioning of the empire by the Treaty of Verdun (843) between Louis's sons (Lothair, Charles the Bald, and Louis the German); Muslim, Norman, and Magyar invasions and the debilitation of central authority
 - ii. The Frankish world: society, institutions, economic life, the church (triumph and reform of Benedictine monasticism, birth of the Cluniac order), literature (Carolingian renaissance) and the arts

- c. The East Frankish kingdom (Germany): the last Carolingians (to 911), the emergence of the four stem duchies (Saxony, Franconia, Swabia, and Bavaria)
- d. The West Frankish kingdom (France): dynastic rivalry between Carolingians and Robertians (to 987) and the ascendancy of the feudal magnates
- e. The Middle Frankish kingdom (Lotharingia): Burgundy, Provence, and Italy
- 2. The British Isles and Scandinavia (c. 800–1066)
 - a. England: the decline of Mercia and the rise of Wessex; the 9th-century Danish invasions; King Alfred's legal, administrative, and ecclesiastical policies and patronage of the arts; Anglo-Saxon political unification and monastic revival in the 10th century; the conquest of the Danes and their rule over the Anglo-Danish state; the reign of Edward the Confessor and the Norman Conquest
 - b. Development of the Kingdom of Scotland, the Welsh, Ireland during the Norse invasions
 - i. Roman penetration in Scotland: Christianity, Norse influence
 - ii. Early Christianity in Wales: relations with the Anglo-Saxons, Welsh society
 - iii. Ireland: conversion to Christianity, monasticism, the Norse invasions
 - c. The Viking Age in Scandinavia: the Vikings and Varangians, widespread raids and conquests (c. 800–c. 1050), social and political organization, arts, paganism and conversion to Christianity from c. 850
- 3. Germany, Burgundy, and Italy: development of the Holy Roman (German) Empire (911–1056)
 - a. Revival of central authority in Germany and intervention in Italy by the Saxon dynasty: Conrad (911–918), rise of the nobility, early opposition from Arnulf of Bavaria, drive against Magyars and Slavs, Germanic kingship
 - b. Promotion of the German church under Otto I (936–973): his conquest of Italy and establishment of the Holy Roman Empire (962), early Salian kings (1024–56)
 - c. Development of medieval Italy: political, economic, and social developments on the peninsula and in Sicily
 - i. Growth in power of the papacy; early years of the commercial cities of Venice in the north and Gaeta, Naples, Sorrento, and Amalfi in Campania; the Arabs in Sicily
 - ii. Cities and countryside: persistence of an urban tradition despite the exodus to rural areas, the role of bishops in urban life, economy and society
- 4. The Kingdom of France under the early Capetians (987–1180): the relative weakness of the monarchy vis-à-vis the great feudatories, establishment of an Anglo-French domination in western France under the Plantagenets (Normandy, Anjou, Aquitaine), Capetian attempts to expand the royal domain
- 5. Growth of the Christian states in northern Spain (Asturias–Leon–Castile, Navarre, Aragon–Catalonia): their relations with one another and with the Muslims in Spain, the first phase of the Reconquista to the fall of Toledo (1085)
- 6. The sociopolitical and economic structure of early medieval Europe: origins, development, and spread of feudalism; its elements and structure; the manorial economy and mainly localized commerce to c. 1050
- E. Peoples and states of eastern Europe to c. 1050: early empires and later development of Christianized states
 - 1. The Slavic peoples: origins, early society and culture, movement into Pannonia and south Russia, plundering expeditions and eventual settlement in the Balkans
 - 2. The eastern European states and peoples within the Byzantine orbit
 - a. The Bulgarian domains to 1018: origins, migration into the Balkans (c. AD 650) and mixture with the local Slavic populations, early contacts and wars with Byzantium, adoption of Christianity (870), the First Bulgarian Empire (893–1014) and subsequent conquest by Byzantium
 - b. The Balkans: the migration of the Croats and Serbs into the Balkans and their subsequent relations with the Bulgars and Byzantium to c. 1050
 - c. Exploration and the rise of the Rus raids on Constantinople, development of trade routes, Khazar state north of the Black Sea
 - d. The princes of Novgorod (end of the 9th century)
 - e. The state of Kievan Rus (c. 980–1054): Slavic-Varangian (Scandinavian) origins, economic decline, social and political institutions
 - 3. Eastern European states within the orbit of Western Christendom

- a. Developments in Moravia and Bohemia to 1055: the Celtic and Germanic tribes supplanted by Slavic peoples in the 6th century, Czech dominance in the 8th century, unification under the Přemysl rulers
 - i. Unification of Greater Moravia under Mojmir (814): religious conflicts with Frankish clergy and temporary adherence to the Eastern rite, political expansion
 - ii. The early Přemysl rulers of Bohemia: capital at Prague, ties with Bavaria and the Saxon dynasty, Boleslav I (929–967), Boleslav II (967–999), annexation of Moravia under Břetislav (1034–55)
 - b. The Avar Empire and the early Magyar (Hungarian) kingdom to c. 1050: alliance with the Carolingian ruler Arnulf, establishment of the Árpád dynasty, settlement of the central plain, conversion to Christianity, reign of Stephen I (997–1038)
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 - a. Military revival, relations with Slavs and Bulgars, estrangement from the West
 - b. Culture and administration: legal reforms under Basil I and Leo VI
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 3. Byzantine decline and subjection to Western influences: 11th-century weakness, arrival of new enemies, the schism with Rome (1054)
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Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and a biography dealing with Western Europe, the Byzantine (Eastern Roman) Empire, and eastern Europe from AD 395 to c. 1050

Austria	France	Ireland	Steppe, The
Balkan States	Germany	Istanbul	History of the
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Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the Empire of the Caliphate and its successor states to c. AD 1055

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General subjects

caliph	ḥājib	Kūfah	Ṣaqālibah
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 - ii. The Jagiellon dynasty (1382–1492): the union of Poland and Lithuania (1385–86), extension of the empire, growth of parliamentarianism dominated by the nobility

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with western Christendom in the High and later Middle Ages (c. 1050–c. 1500)

Amsterdam	Finland	Ireland	Poland
Antwerp	Florence	Italy	Portugal
Austria	France	Lisbon	Prague
Baltic States	Germany	London	Rome
Belgium	Habsburg, The	Luxembourg	Spain
Crusades, The	House of	Madrid	Sweden
Czech and Slovak Republics	Holy Roman Empire, The	Milan	Switzerland
Denmark	History of the	Naples	United Kingdom
European History and Culture	Hungary	Netherlands, The	Venice
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General subjects

<i>European politics and polity:</i>	Hundred Years' War	Teutonic Order	Barnet, Battle of
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Tewkesbury,
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Towton, Battle of
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Statutes of
(1275-90)
*national affairs—east
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- British Isles and
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Simon de	Bolesław III	(France)	(German king)
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Northumberland,	(Bohemia)	Charles VIII	Frederick I
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Sir John	(Poland)	Guesclin,	Frederick II
Owain Gwynedd	Casimir IV	Bertrand du	(emperor)
Pembroke,	(Poland)	Henry I (France)	Guy (Flanders)
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(England)	Ladislav IV	Louis X (France)	(emperor)
Richard III	(Hungary)	Louis XI (France)	Henry VII
(England)	Ladislav V	Lusignan family	(emperor)
Robert II	(Hungary)	Marcel, Étienne	Henry (VII)
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Robert III	Zbigniew	(Burgundy)	Hermann von
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(England)	Wenceslas I	Suger	(emperor)
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Section 924. The Crusading Movement, the Islāmic States of Southwest Asia, North Africa, and Europe, and the States of Eastern Christendom from c. 1050 to c. 1480

- A. The expansion of western Europe in the crusading movement and the Muslim response, the states of Eastern Christendom and the crusader states from c. 1050 to c. 1480
 1. The crusading era and the states of Eastern Christendom (c. 1050–c. 1480)
 - a. The First Crusade (1096–99) and the establishment of the Latin states
 - i. Background of the First Crusade: overcrowding in Christian Latin Europe and the wish of the church to divert the violence between Christians to an attack on the infidels, religious renewal in Europe, disruption of the pilgrimage routes by the Muslims, role of papal leadership at the Council of Clermont (1095), preparations for the Crusade and its participants
 - ii. The sieges of Antioch (1097–98) and Jerusalem (1099): establishment of the crusader states
 - b. The Second (1147–48) and Third (1188–92) crusades: Christian colonization in the East and export of feudalism, the crusader states to 1187, the institutions of the First Kingdom, the magnates of the Third Crusade
 - c. The Byzantine Empire from 1081 to 1204, policies aimed at revival implemented by Comnenus dynasty
 - i. Alexius I Comnenus and the First Crusade: pressures from the Seljuqs and Pechenegs
 - ii. The later Comneni and fluctuating relations with the Venetians, Normans, and crusaders
 - iii. The Fourth Crusade (1202–04) and the establishment of the Latin empire
 - d. The later crusades: decline of the crusading movement and of the Latin enclaves, results of the crusades
 - i. The Latin East after the Third Crusade: the Fifth (1218–21) and Sixth (1227–29) crusades; oriental politics of Emperor Frederick II
 - ii. The crusades of Louis IX of France (1248–50, 1270), final loss of the crusader states, Kingdom of Cyprus; survival of the spirit of the crusades among Latin Christians
 - e. Russia (1054–1300): the lands of Rus and the rise of new centres (*e.g.*, Novgorod, Vladimir, Galicia), the Mongol invasion (1223) and Tatar rule
 - f. The Second Bulgarian Empire under the Asenid dynasty from c. 1185, decline after 1241
 2. The Slavic states of Eastern Christendom from c. 1300 to c. 1500
 - a. Russia: the rise of the Muscovite state under the suzerainty of the Golden Horde and its later successful revolt (1380), expansion and establishment of Moscow as the leading Russian power under Tsar Ivan III (1462–1505), foreign policy
 - b. The Balkans: growing strength of Serbia vis-à-vis the Byzantine and Bulgarian empires; subjugation of Albania, Macedonia, and Bulgaria under Stefan Dušan in the 14th century; Romania; subjection to the Ottoman Turks by 1453
 3. Restoration of the Byzantine Empire under the Palaeologus dynasty (1261), efforts to restore Byzantine power in the Balkans, foreign relations, cultural life
 - a. Michael VIII (1261–82) and attempts to revive the empire, threats from the West, relations with the papacy
 - b. The successors of Michael VIII: cultural revival, civil wars
 - c. Turkish expansion, limited recovery by the Byzantine Empire before the final Turkish assault, the fall of Constantinople (1453)
- B. The Islāmic states of Southwest Asia, North Africa, and Europe (c. 1050–c. 1480): Turkish and Kurdish dynasties, the Mongol invasions, and the rise of the Ottoman Empire
 1. Southwest Asia before the Mongol invasions
 - a. The Great Seljuq Empire in Syria, Iraq, and Iran (c. 1050–c. 1190)

- i. Origins and conversion of the Seljuqs to Islām and their establishment in Khorāsān (c. 1000) under Maḥmūd of Ghazna, the foundation of the Seljuq state under Toghrīl Beg (1038–63), his conquest of Iran and Iraq and establishment of a protectorate over the ‘Abbāsīd caliphate
 - ii. Extension of Seljuq hegemony into Syria and Palestine and victory over the Byzantines, partition and partial breakup of the empire after 1092, Seljuq restoration of Sunnī supremacy and patronage of the Iranian cultural revival
 - b. Great Seljuq successor states (c. 1100–c. 1250): the Zangīd *atabegs* in Syria and northern Iraq, the Ismā‘īlī Assassins in Iran and Syria (c. 1090–c. 1250), the Khwārezm shahs of Iran and Central Asia (1097–1234), other dynasties
 - c. The foundation of the independent sultanate of Rum from territory conquered from Byzantium in Anatolia (from 1071), commercial prosperity and territorial expansion in the 13th century, the Turkish Dānishmendīd state in northern Anatolia (c. 1071–1177) and its absorption by the Seljuqs
2. The Mongolian invasions of eastern Europe and Southwest Asia in the 13th century
 3. Southwest Asia and eastern Europe after the Mongolian invasions
 - a. Mongol successor states (c. 1250–c. 1480)
 - i. The Mongolian Il Khans in Iraq and Iran (c. 1250–1353): trade, administration, and eventual conversion to Islām; the Timurids and other Il Khan successor states
 - ii. The khanate of the Golden Horde in eastern Europe (from 1240): adoption of Islām, gradual absorption of the Mongols into the Turkish *ulus* to form the Tatar people, the zenith of the empire in the early 14th century, Timur’s invasion (1395) and its later partition
 - b. Turkish Anatolia and the rise of the Ottoman Empire to 1481
 - i. Origins and expansion of the Ottoman state (c. 1300–1402): its expansion in Anatolia and conquest of Serbia and Bulgaria in the 14th century, defeat by Timur (1402), restoration of the empire and beginning of the Ottoman challenge to the European states by the invasion of Hungary (1434), conquest of Constantinople (1453) and conquest of Anatolia
 - ii. Development of Ottoman administrative and military institutions
 4. North Africa and Muslim Spain (c. 1050–c. 1490)
 - a. The decline of the Fāṭimids (c. 1050–1171) in the face of Seljuq and crusader invasions
 - b. The Ayyūbids and Mamlūks in Egypt and Syria (1171–c. 1500)
 - i. Establishment of the Ayyūbid dynasty in Egypt and expansion of its control over Muslim Syria under Saladin (1171–93): conflict with the crusader states, pacific policies of his successors
 - ii. Displacement of the Ayyūbids by the Turkish Mamlūks in 1250, the Bahri Mamlūks’ resistance to the Mongols and extension of European power in Syria under Quṭuz and Baybars I (1260–77), their displacement by the Burjī Mamlūks in 1382, Mamlūk administration and military institutions, the continued maintenance of Sunnī orthodoxy
 - c. The Berber Almoravid and Almohad empires in northwest Africa and Spain (1056–1269)
 - i. Almoravid origins as a religious reform federation in the western Sudan, conquest of Morocco and western Algeria under Abū Bakr and Yūsuf ibn Tāshufīn (1062–92), the latter’s intervention in Spain against the expanding Christian states, Almoravid conquest of Muslim Spain (1090–91), weakness and decline in the face of the renewal of the Reconquista and the Almohad revolt in North Africa (c. 1123)
 - ii. The Almohad religious reform movement under the Berber Muḥammad ibn Tūmart (d. 1130) and the extension of Almohad control over Muslim Spain (capital at Seville) and the Maghrib (1145–72), initial containment of the Reconquista and later disintegration of the empire in Spain after 1212, subsequent eclipse in the Maghrib, Almohad patronage of philosophy and the arts
 - d. The east medieval dynasties of North Africa (13th–15th century): political and cultural developments
 - i. The Ḥafṣīds in Tunisia, the ‘Abd al-Wāḍid kingdom of Tīlīmāsān, the Marinīds in eastern Morocco and their problems with the Arabs, political life, the Naṣrīd kingdom of Granada
 - ii. Religious, intellectual, and artistic life: Ṣūfism, literary and artistic influences from Muslim Spain

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the crusading movement, the Islāmic states of Southwest Asia, North Africa, and Europe, and the states of Eastern Christendom from c. 1050 to c. 1480

Balkan States	Crusades, The	Jerusalem	Syria
Byzantine Empire,	Egypt	North Africa	Transcaucasia
The History	Islāmic	Russia	Turkey and
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MICROPAEDIA: Selected entries of reference information

General subjects

<i>Balkans:</i>	Kipchak	Moor	<i>Middle East—other:</i>
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(1448)	Pechenegs	<i>Middle East—</i>	Kara Koyunlu
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<i>Christians—Balkans</i>	Manuel I	<i>Muslims—Iberia and</i>	Mehmed II
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Division III. Peoples and Traditional Civilizations of East, Central, South, and Southeast Asia

[For Part Nine headnote see page 343.]

For each nation or group of peoples covered in this division, the outline treats first of the geography and ethnography and then moves into the chronology of the respective civilization: Sections 931 and 932 outline the Chinese dynasties from the Ch'in through the late Ch'ing (mid-19th century).

Section 933 deals with the peoples of inner Asia and the steppe and covers the early histories of Manchuria, Turkistan, and Afghanistan; of the Mongol Empire and its successor states; and of Tibet and Nepal.

Section 934 outlines the character and achievements of the Japanese and Korean civilizations from their beginnings until the Meiji Restoration of 1868 and the Japanese annexation of Korea in 1910.

Sections 935 and 936 treat of the civilizations of the Indian subcontinent, of the early political units of India and Ceylon, the period of Muslim hegemony, the Mughal and Marāthā empires, and, for Ceylon, the arrival of the Portuguese in 1505.

Section 937 deals with the peoples and civilizations of Southeast Asia, including the histories of Burma, Siam, Cambodia, Vietnam, and Malaya, as well as the islands of the Indonesian Archipelago, until c. 1600.

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Section 931. China to the Beginning of the Late T'ang (AD 755)

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- B. The emergence of traditional Chinese civilization
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 - a. The Paleolithic and Mesolithic stages in North China: industries in the Ordos region, microlithic tools
 - b. The Neolithic stage: pebble tools and domesticated animals, "Mongolian Neolithic"
 - c. The Yang-shao Painted Pottery culture
 - i. Stratigraphy: villages of Hsi-yin-ts'un and Yang-shao-ts'un, pottery styles
 - ii. Painted pottery styles, sites in Kansu, ornamental designs, stone implements
 - d. The Lung-shan Black Pottery complex and western limits of Black Pottery culture, the Late Neolithic Period in South China and the Early Bronze Age in North China, bronze objects in the Ordos region
 2. The beginnings of the Chinese civilization: the early dynasties
 - a. Origins of the Chinese people and culture: legends and cultural centres, the Hsia dynasty (c. 2205–c. 1766 BC)
 - b. The Shang, or Yin, period (c. 1766–c. 1122 BC): Chengchow site as early capital and cultural centre at Anyang, social system, early calendar, warfare, industry and commerce, script
 - c. The Western (early) Chou (1122–771 BC): the conquest of Shang under Wen Wang and Wu Wang (1111 BC), Chou feudal system
 - d. The Eastern (later) Chou (771–481 BC), also called the Chun Ch'iu period; internal chaos; period of the Warring States (481–221 BC)
 - i. Breakdown of the Chou feudal system: capital at Loyang, rivalry among Chou states, various Chou successor states in the Warring States period (481–221 BC)
 - ii. Social, political, and cultural changes: decline of feudalism, urbanization and assimilation, rise of monarchy under Wen Kung, economic development
 - e. The Classical period of Chinese literature and philosophy: Chinese religion and cosmology, Confucianism and Taoism, the "hundred schools" (the Naturalists, the Dialecticians, Mo-tzu, Meng-tzu [Mencius], Chuang-tzu, the Legalists)

C. The unification of China under the Ch'in and Han dynasties (221 BC–AD 220)

1. Establishment of the Ch'in empire (221–206 BC): development of central government, fall of the dynasty after death of Shih Huang Ti
 - a. Early successes of the Ch'in under Mu Kung, reforms of Hsiao Kung and Shang Yang
 - b. Ch'in strategy, unification of China by the Ch'in (221 BC), abolition of feudal system, highway building and construction of the Great Wall in the reign of Shih Huang Ti, the minister Li Ssu, political repression
2. The Han dynasty
 - a. Western (Former or Earlier) Han (206 BC–AD 8) and the Wang Mang usurpation (AD 9–23)
 - i. Establishment of the dynasty by Liu Pang (Han Kao Tsu): the capital at Ch'ang-an, reign of Liu Heng (Han Wen Ti) from 179 to 157 BC, consolidation of Imperial power
 - ii. Expansion under Han Wu Ti (140–87 BC) into southern China and Central Asia, dynastic crisis (91–87 BC), ascendancy of the Wang family and Wang Mang's usurpation of throne (AD 9–23)
 - b. The Eastern (Later) Han: restoration of the dynasty by Liu Hsiu (Han Kuang Wu Ti) (AD 25–57), capital at Loyang, domestic and foreign policy, decline of government after AD 125
 - c. Political developments, foreign relations, and cultural attainments in the Han period
 - i. The Han political system: the structure and the practice of government
 - ii. Relations with other peoples: the Hsiung-nu of Central Asia, Pan Ch'ao's campaigns in Central Asia
 - iii. Han cultural life: educational developments, invention of paper, prose writing, developments in music and the visual arts, introduction of Buddhism

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1. The Six Dynasties period (AD 220–589)
 - a. The division of the empire into the Three Kingdoms of Wei (North China), Shu Han (Szechwan), and Wu (South China): era of barbarian invasions and rule, the period of the Sixteen Kingdoms (304–589)
 - b. Intellectual and religious trends: decline in Confucianism, Taoist resurgence, spread of Buddhism
2. The reunification of China under the Sui and early T'ang dynasties
 - a. The Sui (581–618): Sui founder Yang Chien (Sui Wen Ti), institutional reforms
 - b. The reign of Yang Ti (605–618): integration of the South, foreign affairs, military reverses and collapse of the dynasty
 - c. The early T'ang (618–624) and the period of T'ang power (626–755)
 - i. Li Yüan's (618–626) establishment of the dynasty: resistance to T'ang conquest, administration of the state, fiscal and legal system
 - ii. The era of good government in the reign of T'ai Tsung (626–649): educational and administrative reforms, conquest of eastern Turks, Kao Tsung (649–683) and influence of Empress Wu, conquest of Oxus Valley and later military reverses
 - iii. Prosperity and progress in the reign of Hsüan Tsung (712–756): internal reforms, military reorganization

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with China to the beginning of the late T'ang (AD 755)

Asia
China
Nanking

MICROPAEDIA: Selected entries of reference information

General subjects

*ancient cultures and
historic sites:*
Ch'i-chia culture

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Great Wall of
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Hsiung-nu
Lung-shan culture
Pan-p'o-ts'un

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dynastic capitals:
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Nanking	Han dynasty	Sui dynasty	equal-field system
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<i>leaders:</i>	Ts'ao Ts'ao	Hsiao-wen ti	Wang Mang
Chao Kao	<i>philosophers:</i>	Hsüan Tsung	Wen-ti (Sui)
Hsiang Yü	Chuang-tzu	(T'ang)	Wu Hou
Li Ssu	Confucius	Kao-tsu (Han)	Wu-ti (Chin)
Lü Pu-wei	Lao-tzu	Kao-tsu (T'ang)	Wu-ti (Han)
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 - a. The late T'ang (755–907): the rebellion of An Lu-shan (755–757) and its effects, provincial separatism, attempts to restore central authority, growth in power of provincial warlords
 - b. T'ang cultural life: the growing influences of Buddhism, developments in music and the visual arts
 - c. Social and economic developments: the decline of the aristocracy and social mobility, agricultural advances and expansion of trade
 - d. The period of the Five Dynasties and the Ten Kingdoms (907–960)
 - i. The short-lived Five Dynasties in North China: the Liang dynasty, advance of talented bureaucrats in government posts
 - ii. The more permanent Ten Kingdoms: the Tanguts; the Khitan, or Liao, empire; the kingdoms of Wu, the Southern T'ang, the Southern P'ing, the Ch'u, the Earlier and Later Shu, the Min, the Southern Han, and the Wu-yüeh
 - e. The Northern Sung (960–1126): foundation of the dynasty and its expansion under T'ai-tsu and T'ai-tsung and their successors
 - i. Unification and centralization of the empire: development of the Imperial civil service in T'ai-tsu's reign (960–976), further consolidation under Chen Tsung (998–1022)
 - ii. Reforms in the reign of Shen Tsung (1068–85): leadership of Wang An-shih, criticism of the reforms leading to the decline and fall of the dynasty
 2. The Southern Sung (1127–1279): survival and consolidation, defeat by the Juchens and removal of the Sung to South China under Kao-tsung
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- B. Mongol–Chinese rule under the Yüan dynasty (1279–1368)
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 - i. Peasant uprisings and the foundation of the dynasty (1368) by Chu Yüan-chang (Hung-wu); pattern of dynastic succession, gradual degeneration of Ming government
 - ii. Government and administration: local and central government, later innovations to coordinate central government and regional administration
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 - i. Manchu entrance in Peking and territorial conquest ending with the seizure of Taiwan (1683): early Ch'ing institutions
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 - c. Dynastic degeneration and widespread governmental corruption beginning in the 1760s; economic decline, famine, and social unrest in the early 1800s

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and a biography dealing with China from the late T'ang (AD 755) to the late Ch'ing (c. 1839)

Asia	Genghis Khan
Canton	Nanking
China	Peking
Chungking	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>capital cities:</i>	Yang-chou	Sung dynasty	kowtow
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<i>emperors:</i>	T'ai-tsu (Sung)	Cheng	Wu San-kuei
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 2. The Manchurian tribes: attempts at unification, fluctuating relations with the Chinese until the advent of the Mongols
 - a. The Tung-hu tribes and Chinese presence in Manchuria to the 3rd century BC, ascendancy of the Hsien-pei and establishment of the Yin kingdom by Mu-jung Hui (AD 352), the Parhae (P'o-hai) kingdom (AD 712)
 - b. The Khitan and Juchen empires: penetration into China, Korea, and Mongolia; Juchen conquest of Chinese Sung territory; capital at Yen-ching (Peking); conquest by Mongols in 1234
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 - a. West Turkistan: the early empires, Muslim rule, the Chagatai khans and Timurids, the Uzbek and Kazakh khanates
 - b. East Turkistan (Kashgaria): Kyrgyz, Uighur tribes, Qarakhanid rule in the 10th century, Mongol conquest and rule in the 13th century, conquest by Manchus (1758–59)
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- C. The Mongol Empire and its successor states
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 - a. The rise of Genghis Khan and his military and political organization, tactics, and conquests
 - b. The division of his empire among his sons: further expansion under Ögödei Khan, Mangu (Möngke) Khan's friendly relations with Western Christendom
 2. The Mongol successor states
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 - b. The Chagatai khanate (*ulus*) of Turkistan in the 13th and 14th centuries
 - c. Timur's (Tamerlane's) establishment of the Timurid dynasty (1370–1506): his capital at Samarkand; his conquests; Turkistan, Afghanistan, and Transoxania under his successors
 - d. The Iranian Il Khans (1258–1335): the Golden Horde (later Kipchak empire) in eastern Europe and its successor states (1240–1783)

- e. Mongolia from the 13th to the 18th century: internecine strife, the revival of Buddhism, subjection to Yüan China and later autonomy and disunity until the ascendancy of the Manchus (Ch'ing China) in the 18th century

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- b. Tibetan disunity from the 9th to the 14th century: eclipse and resurgence of Buddhism, conquest by Mongols, developments in literature and the visual arts
- c. Rule by the Dge-lugs-pa (Yellow Hat) monastic order, unification of Tibet (1642), Tibet under Chinese overlordship (1720)

2. Nepal to c. 1750: rule by Indian princely families, influence of Hinduism, relations with China and Tibet

- E. The waning of nomad power from the 16th to the 18th century: the Manchu conquest of China and parts of Inner Asia, the Afghans as the last nomad power in Inner Asia, Russian expansion into Siberia and western Turkistan

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and a biography dealing with inner (Central and Northeast) Asia to c. 1750

Asia
Central Asia
China
Genghis Khan
Mongolia
Nepal
Steppe, The History of the Eurasian

MICROPAEDIA: Selected entries of reference information

General subjects

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- B. Early Japan
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 2. The ancient period: unification of Japan under the Yamato court and subsequent governments (c. 250–710)
 - a. The rise and fall of the Yamato court: relations with Korea, internal power struggles, introduction of Buddhism
 - b. The governmental reforms of Shōtoku Taishi of the Soga family: theories of ideal government, the 12 court rank and the “Seventeen Article Constitution,” relations with China, spread of Buddhism
 - c. The Taika reforms (645), elimination of the Soga family, land reform, intervention in Korea, the *ritsu-ryō* system of social and land reform
 3. The Imperial state from 710 to 1185
 - a. Government-directed religious and cultural developments in the Nara period (710–784): flowering of Buddhism; Chinese and Indian influences on literature, music, and the visual arts
 - b. The Heian period (794–1185): changes in the *ritsu-ryō* system, ascendancy of the Fujiwara family and growing importance of the aristocracy
 - i. Failure of Taika land reforms, power struggles among the nobility, growth of Fujiwara control over government, rise of Japanese literature and rejection of Chinese culture
 - ii. Government by “cloistered” emperors: decline of Fujiwara power and rise of the samurai class, the Hōgen (1156) and Heiji (1159) uprisings, introduction of feudalism
- C. Feudal Japan
 1. The Kamakura period (1192–1333)
 - a. Minamoto Yoritomo and the founding of the *bakufu* (shogunate) at Kamakura (1192), the samurai *shugo* as feudal lords
 - b. The rise of the Hōjō family from 1199: the Jōkyū Disturbance (1221), Hōjō Yasutoki’s (1224–42) administrative reforms, the Jōei law code
 - c. Resistance to the Mongol invasions of Japan (1274 and 1281), the Kamakura *bakufu* and feudal administration of farming regions
 - d. Buddhist culture during the Kamakura period (e.g., growth of Zen) and Neo-Confucianism; literature, philosophy, and the visual arts
 - e. Decline of Kamakura society: economic problems leading to the rise of daimyo (domain lord) class and decline of *bakufu*
 2. The second feudal era: the Muromachi, or Ashikaga, period (1338–1573)
 - a. The Kemmu Restoration (1333) and return to direct Imperial rule: the emperor Go-Daigo, the Kemmu legal code, Ashikaga Takauji and the dual dynasties (1336–92)
 - b. Yoshimitsu’s establishment of the Muromachi *bakufu* (1378) and unification of the dual dynasties (1392): taxation and strong military governors, feudal warfare after 1428
 - c. Increased trade with China: piracy, the Ōnin War (1467–77), provincial self-government and growing influence of farmers
 3. The period of the “warring country” and the beginning of unification under the Oda regime
 - a. Unification under *sengoku* (civil war) daimyo league leaders: development of commerce and guilds
 - b. Arrival of the Portuguese (1543) and Spanish (1549): opening of trade, Catholic Jesuit missionary activity (1549)

- c. Cultural development in the 15th and 16th centuries: the influence of Zen Buddhism on philosophy, drama, literature, and the visual arts
- d. The Azuchi-Momoyama period (1574–1600): unification under Oda Nobunaga (1549–82) and Toyotomi Hideyoshi (1582–98)
- 4. The Tokugawa period (1603–1867): military–bureaucratic rule
 - a. Establishment (1603) and consolidation of the Tokugawa (Edo) shogunate by Tokugawa Ieyasu: Japanese policy of national seclusion (1630s) from Christian missionaries and most European traders
 - b. The Tokugawa postfeudal military–bureaucratic system: class structure and *bakuhau* system
 - c. Industrial and commercial developments, advances in literature and the visual arts
 - d. The weakening of the *bakuhau* system and its eventual collapse
 - i. Economic crises: impoverishment of small farmers and commercial problems, political reform, opening of Japan to Western influences (1840s)
 - ii. Cultural developments in the 18th and 19th centuries: Confucianism and the Shintō revival, Buddhism, literature and the visual arts
 - iii. The Tempō reforms and downfall of the *bakuhau*: economic and administrative measures, pressure from Europe and the U.S.
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 - 2. The Three Kingdoms of Korea (Koguryō, Paekche, and Silla) and their interactions (c. 57 BC–AD 668), introduction of Buddhism, literature and the visual arts
 - 3. The unification of Korea under Silla control (668–935): adoption of Chinese governmental organization and land tenure system, emergence of provincial magnates, cultural developments
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 - a. The establishment of a Confucian state: royal bureaucratic government, decline of Buddhism and emergence of Confucian culture, introduction of printing
 - b. Invasions by Japan (1592–98) and the Manchu (c. 1619–1636): Korea as a Ch'ing (Manchu) vassal, Silhak scholarship and cultural development, introduction of Roman Catholicism
 - c. Relations with foreign countries: growth of Japanese influence, the Tonghak Revolt (1894) and government reform, Japanese supremacy in Korea (1910)

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with Japan to the Meiji Restoration (1868), and Korea to 1910

Asia
 Japan
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MICROPAEDIA: Selected entries of reference information

General subjects

<i>Japan—government and society:</i>	han	shugo	Hōgen Disturbance
be	kabane	tennō	Jinshin-no-ran
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Yoshimitsu	Hōjō Tokimune	Tanuma Okitsugu	Alessandro
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- B. India from the prehistoric period to AD 300: the emergence of civilization in the Indus River Valley, the growth of kingdoms and the great empires
 1. Late Stone Age hunters and Neolithic settlement in Baluchistān and the Indus Valley, first settlements east of the Indus
 2. Indus civilization (c. 2300–c. 1750 BC): social, economic, and cultural developments
 - a. Development of urban centres; e.g., Mohenjo-daro, Harappā, Kalibangan, Lothal
 - b. Developments in agriculture, animal husbandry, metalwork and pottery, transportation, and trade
 - c. Developments in languages, religion, and the visual arts
 3. The development of the Indo-Aryan states (c. 1500–600 BC): urbanization at Kāśī (Vārānasi) and elsewhere in the Ganges Valley, other cultures in the Indian subcontinent
 - a. Early Ganges cultures to c. 1200 BC: social organization and religious development
 - b. Later Ganges cultures to c. 600 BC: development of the caste system and emergence of Brahman, Kṣatriya, Vaiśya, and Śūdra castes

4. Pre-Mauryan states (c. 600–150 BC): development of political and economic systems, Taxila as a cultural centre
 - a. The early development of Buddhism and Jainism, beginning of Magadha ascendancy
 - b. Invasion by Alexander the Great (327 BC) and establishment of Greek settlements
 5. Development of the Mauryan empire (c. 321–185 BC): the capital at Pāṭaliputra (Patna)
 - a. Establishment of the empire by Candra Gupta (c. 321–c. 297 BC) and consolidation by Aśoka (c. 265–238 BC)
 - b. Mauryan economic, social, and administrative developments, evolution of the concept of the state
 6. The rise of small kingdoms in the north (150 BC–AD 300): Indo-Greek and Asian rulers, various local republics and kingdoms (Śuṅga, Kāliṅga)
 7. South Indian civilizations to AD 300
 - a. Development of guilds, banking systems, and extensive maritime trade with the West
 - b. Cultural and religious development; *e.g.*, patronage of religious art and literature, growth of sects in Hinduism and Jainism, assimilation of foreigners into caste society
- C. North India, the Deccan, and South India (AD 300–750)
1. The Guptas of North India (AD 320–540): expansion and administration of territory, invasions by the Hūṇas (c. mid-5th century), successor states to the Guptas
 2. Various kingdoms of the Deccan: the Vākāṭaka dynasty, the Cālukyas, and the Rāṣṭrakūṭas
 3. The Pallavas in South India: developments in religious art and architecture, literature, and science
- D. North India (750–1200), the Deccan, and South India (750–c. 1330): new dynasties and centres of power
1. The tripartite struggle in North India, the Rājput kingdoms, Turkish control in Ghazna from 998
 2. The decline of the Cālukyas in the Deccan and the rise of the Cōḷas in the 10th century, later Hoysaḷas and Pāṇḍyas control, relations with the south
 3. Social, economic, and cultural developments; *e.g.*, feudalism and economic decentralization, partial social mobility, growth of Tantrism, literature and the visual arts
- E. Ceylon from the prehistoric period to the end of the Classical Age (AD 1200)
1. Prehistoric settlements in Ceylon, colonization by Indo-Aryan tribes in the 5th century BC, conversion to Buddhism (c. 3rd century BC)
 2. Ceylon in the Classical Age (c. 200 BC–AD 1200): the Polonnaruva dynasties, growth of Sinhalese political institutions, social and agricultural developments

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the Indian subcontinent and Ceylon to c. AD 1200

Asia
India
Nepal
Sri Lanka

MICROPAEDIA: Selected entries of reference information

General subjects

historic regions and sites:

Bhārhut
Brahmaṛṣi-deśa
Gandhāra
Gauḍa

Gedrosia
Halebīd
Kalibangan
Kaliṅga
Mālwa
Nālanda

Patna
Śrāvastī
Taxila
Vaiśālī
Valabhī
Vārānasi

kingdoms and states:

Anurādhapura
Avantī
Kosala
Magadha
Mauryan empire

<i>peoples and society:</i>	Indus	Rājput	<i>other:</i>
Brahman	civilization	Sūdra	Dīpavamsa
Chandēlā	Kulinism	Vaiśya	Rājatarāṅgiṇī
Hephthalite	Licchavi	Varṇa	Serendib
	Mallas	Yavana	Tarāorī, Battles of
Biographies			
Aśoka	Gaṅga dynasty	Mahendra	Śaiśunāga dynasty
Buddha	Gurjara-Pratihāra	Maitraka dynasty	Śaka satrap
Cālukya dynasty	dynasty	Menader	Samudra Gupta
Candra Gupta	Harṣa	Nanda dynasty	Sātavāhana
Candra Gupta I	Hoysaḷa dynasty	Pāla dynasty	dynasty
Candra Gupta II	Īśānavarman	Pallava dynasty	Sena dynasty
Cōḷa dynasty	Kalacuri dynasty	Pāṇḍya dynasty	Śuṅga dynasty
Duṭṭhagāmaṇi	Kaṇiṣka	Parākramabāhu I	Vākāṭaka dynasty
Gāhaḍavāla	Kauṭilya	Rāṣṭrakūṭa	Yādava dynasty
dynasty	Kushān	dynasty	

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Section 936. The Indian Subcontinent from c. 1200 to 1761, and Ceylon from c. 1200 to 1505

A. North India under Muslim hegemony (c. 1200–1526)

1. The completion of the Ghūrid conquest; the Delhi sultanate (1206–1526): the military and administrative policies of the five dynasties
 - a. The consolidation of the conquest of North India by the Slave dynasty (1206–90)
 - b. The revival of efficient administration by the Khaljī dynasty (1290–1320)
 - c. The Tughluq dynasty (1320–1413): administrative reforms by Muḥammad ibn Tughluq (1325–51), Mughal invasion (1398) and decline of Tughluq control
 - d. Tenuous control by the Sayyid dynasty (1414–51), expansion and decline of Lodī dynasty (1451–1526)
 - e. Cultural and religious developments during the Delhi sultanate; *e.g.*, Islāmic and Hindu movements and education
2. The 14th-century rise of regional kingdoms in the north: Bengal, Mālwa, Gujarāt, Jaunpur, and Kashmir

B. The Deccan (c. 1320–1627) and South India (1336–1646)

1. The Deccan (c. 1320–1627): the Bahmanī dynasty and the five Deccan sultanates
 - a. The Bahmanī dynasty (1347–c. 1527): introduction of Muslims into the Deccan and their relations with the Hindus
 - b. The rise (c. 1500) of the five sultanates of Ahmadnagar, Berār, Bidar, Bijāpur, and Golconda; Muslim–Hindu relations; Mughal conquests in the Deccan in the 16th century
2. The Hindu Vijayanagar empire (1336–1646) in South India
 - a. Foundation of the state (1336) and its expansion in South India: conflicts with Muslim dynasties in the Deccan, decentralization and decline of state
 - b. Administrative and social organization of the empire, cultural and religious development

C. The beginning of the political and administrative unification of the subcontinent under the Mughal Empire (1526–1761)

1. The origins of the Mughals: the conquest of North India under Bābur, the Mughals' use of firearms
2. Extension and consolidation of empire by Akbar (1556–1605)
 - a. Subjection of neighbouring territories: the conquest and annexation of Bihār, Bengal, Afghanistan, and Kashmir
 - b. Akbar's administrative, fiscal, military, judicial, and religious policies

3. The empire under Jahāngīr (1605–27), Shāh Jahān (1628–58), and Aurangzeb (1659–1707): developments in the arts and agriculture
 4. Mughal decline in the 18th century: dynastic disputes and weakness after 1707 culminating in foreign invasions (1731–61)
- D. The emergence of the Marāṭhā empire in Mahārāshtra: rise to power and decline after 1761
1. The foundation (1674–80) of the dynasty by Śivājī: his challenge to Mughal authority in the Deccan, the Marāṭhā war of independence
 2. The Marāṭhās as the major power in India in the early 18th century: the contribution of the peshwas (chief ministers) to Marāṭhā success, struggle with the Portuguese, establishment of the Marāṭhā confederacy
- E. Ceylon from c. 1200 to the arrival of the Portuguese (1505)
1. Political and economic changes in the Sinhalese state: collapse of central authority, foreign invasions, growth of foreign trade
 2. Developments in culture and the Buddhist religion

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the Indian subcontinent from c. 1200 to 1761, and Ceylon from c. 1200 to 1505

Asia
India
Nepal
Sri Lanka

MICROPAEDIA: Selected entries of reference information

General subjects

<i>government and society:</i>	<i>historic events:</i>		<i>kingdoms and states:</i>
Ashta Pradhan	Barāri Ghāt,	Bharatpur	Bahmanī
Cūlavamṣa	Battle of	Bijāpur	sultanate
Faṣlī era	Gogūnda, Battle of	Chandragiri	Bundelā
Ḥabshī	Jājau, Battle of	Golconda	Delhi sultanate
jāgirdār	Karnāl, Battle of	Gulbarga	Hyderābād
Mahāvamṣa	Pānīpat, Battles of	Kāmarūpa	Jaffna
maṇṣabdār	Tālikota, Battle of	Karnāṭaka	Kotte
peshwa	<i>historic regions and sites:</i>	Mahāvihāra	Marāṭhā
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rājākariya	Bengal	Serendib	
Rājāvaliya		Vijayanagar	

Biographies

<i>Mughal emperors:</i>	Gaṅga dynasty	Hyder Ali	Prithvi Nārāyaṇ
Akbar	Hoysala dynasty	Iltutmish	Shah
Aurangzeb	Khalji dynasty	Muḥammad ibn	Shēr Shāh of Sūr
Bābur	Lodi dynasty	Tughluq	Sirāj-ud-Dawlah
Humāyūn	Mughal dynasty	Mu'izz-ud-Dīn	Śivājī
Jahāngīr	Slave dynasty	Muḥammad ibn	
Shāh Jahān	<i>others:</i>	Sām	
<i>ruling families:</i>	Gobind Singh	Quṭb-ud-Dīn	
'Ādil Shāhī dynasty	Ḥusayan Shāh	Aybak	
Āraṇḍī dynasty	'Ala' ad-Dīn		

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Section 937. The Peoples and Civilizations of Southeast Asia to c. 1600

- A. The character and achievements of traditional Southeast Asian civilizations, South and East Asian influences, the geography and ethnography of Southeast Asia, archaeological and documentary historical sources, historiographic problems
- B. Mainland Southeast Asia to c. 1600
 1. Myanmar (Burma) from the Anyathian culture (c. 5000 BC–AD 1600)
 - a. Origins of civilization in Myanmar: the Anyathian Stone Age culture, the Mons of southern Myanmar (c. 3rd century BC–11th century AD), Indian trade and cultural influences
 - b. The Tibeto-Burmese invasions of the Upper Irrawaddy Valley and the establishment of the Pyu state of northern Myanmar (c. 100 BC–AD 800)
 - c. The city kingdom of Pagan (849–1287): the influence of Theravāda Buddhism, Pagan as a cultural centre, destruction by the Mongols (1287)
 - d. Myanmar from c. 1300 to c. 1600: reunification and expansion
 2. The Tai people and the kingdom of Siam to c. 1500
 - a. The origins and settlement of the Tais: the kingdom of Nanchao in Yunnan (8th century AD)
 - b. Establishment of Tai power at Sukhothai (c. 1220): social and cultural developments
 - c. Establishment of the Tai state of Ayutthaya (1350): organization of administrative, social, and legal systems; wars with Lan Na during the reign of King Trailok (1448–88)
 - d. Laos to c. 1600: the Lao as a branch of the Tai people, establishment of the Lan Xang kingdom by Fa Ngum (1353–73), later rulers to 1571, successful Burmese invasion (1574)
 3. Cambodia from the prehistoric period to c. 1500
 - a. Prehistoric peoples in Cambodia, mythological origins of kingdom of Funan (c. AD 100) and the influence of Indian culture
 - b. Emergence of the state of Chenla and the decline of Funan in the 6th century
 - c. Establishment of the Khmer state of Angkor (c. 800), religion and the concept of kingship, social and administrative structures, the reign of Suryavarman II (1113–c. 1150), period of instability
 - d. Jayavarman VII (1181–c. 1218) and the reestablishment and extension of Khmer authority
 - e. Decline of the Angkor kingdom after 1220, introduction of Theravāda Buddhism, Tai invasions (1369 and 1389) and fall of city of Angkor (1431)
 4. Vietnam from the prehistoric period to c. 1516
 - a. The legendary and historical origins of the Vietnamese people, the influence of Chinese rule (from 111 BC) on Vietnamese society
 - b. The states of Funan (c. 1st–6th century AD) and Champa (AD 192–1471) in southern Vietnam
 - c. Chinese political and cultural domination of Nam Viet from 111 BC to AD 939; independence under Ly, Tran, and Le dynasties; political unification of Nam Viet and Champa (1471); government and society in precolonial Vietnam
 5. Malaya to the 16th century AD
 - a. Rise of Indianized states and their role in the formation of Malaya: the advent of Islām and the rise of the sultanate of Malacca (c. 1400–1511)
 - b. Early European intrusions: the Portuguese conquest of Malacca (1511), social and political developments in the 16th century
- C. Islands of the Indonesian Archipelago to c. 1600
 1. The settlement of the Indonesian Archipelago: the introduction of Hinduism by Indian Brahmins
 2. The Malay kingdom of Śrīvijaya in southeast Java: the influence of Buddhism, the importance of the maritime trade with China from the 7th to the 12th century
 3. Central Java in the 8th and 9th centuries: cultural, religious, and economic development during the Shailendra dynasty

4. Eastern Java and the rest of the archipelago from 1019 to 1292: political and cultural developments, the Singhasāri empire of Kertanagara and the royal cult
5. The Majapahit empire in eastern Java (1319–89): religious and cultural developments
6. The spread of Islām in Indonesia: the rise of Muslim states in Sumatra and Java (c. late 13th century), conflicts between Islām and older Indonesian cultures

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the peoples and civilizations of Southeast Asia to c. 1600

Asia
Indonesia
Southeast Asia

MICROPAEDIA: Selected entries of reference information

General subjects

<i>Myanmar, Malaya, and Siam:</i>	Ngasaunggyan.	Dong Son culture	Majapahit empire
Dvaravati	Battle of	Funan	priyayi
Hludaw	Nong Sa Rai.	Lovek	Singhasāri
Mon kingdom	Battle of	Nam Viet	Śrīvijaya empire
Mrohaung.	Pagan	Vyadhapura	Tarumanegara
Arakanese	Sadki Na grades	<i>Indonesian</i>	
Kingdom of	<i>Indochina:</i>	<i>Archipelago:</i>	
Nanchao	Angkor	Buginese	
	Champa	Kaḍiri	

Biographies

<i>Myanmar, Malaya, and Siam:</i>	Ramkhamhaeng	Ly Bon	<i>Indonesian</i>
Anwarahta	Toungoo dynasty	Ngo Quyen	<i>Archipelago:</i>
Bayinnaung	Trailok	Nguyen dynasty	Erlangga
Mahmud Shah	<i>Indochina:</i>	Setthathirat I	Gajah Mada
Malacca,	Chan	Suryavarman I	Hayam Wuruk
sultanate of	Dinh Bo Lin	Suryavarman II	Kertanagara
Mangrai	Fa Ngum	Tran dynasty	Shailendra dynasty
Narameikhla	Jayavarman VII	Tran Hung Dao	
Naresuan	Later Ly dynasty	Trung Sisters	
Ramathibodi I	Le Loi		
	Le Thanh Tong		

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Division IV. Peoples and Civilizations of Sub-Saharan Africa to 1885

[For Part Nine headnote see page 343.]

The history of North Africa, because of its early involvement with Europe and Islām, is dealt with up to c. 1480 in Sections 911 and 924; and it is carried to the 19th century in Section 962. The history of Nilotic Sudan to c. AD 550 and of Ethiopia to c. AD 650 is dealt with in Section 911.

With those exceptions, the five sections of Division IV deal first with the geography and ethnology and then with the histories of the peoples and civilizations of the African continent to c. 1885.

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942. The Nilotic Sudan and Ethiopia from c. AD 550 to 1885 390

943. East Africa and Madagascar to c. 1885 391

944. Central Africa to c. 1885 392

945. Southern Africa to c. 1885 392

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- A. The geography and ethnography of West Africa, definition of the region, the archaeological and documentary historical sources and historiographic problems, the character and achievements of civilizations in West Africa
- B. West Africa until the advent of the Europeans (c. AD 1500)
 1. Development of the West African monarchies of Ghana and Kanem to c. AD 1000
 2. Development of the western Sudan empires
 - a. Emergence of the Keita dynasty of the Mali empire (c. 1235): Timbuktu as the cultural and commercial centre of Mali, fall of the Mali empire (c. late 15th century) and rise of the Songhai empire of Gao
 - b. The migrations of the Fulani people, migrations and military conquests of the Mande-speaking peoples, development of trade routes by the Dyula
- C. The precolonial period of European activity (c. 1400–c. 1885): exploration, development of the slave trade, and eventual collapse of indigenous states
 1. Portuguese trade with the Guinea states from c. 1460
 2. The rise and expansion of the Atlantic slave trade (c. 1600–c. 1860): the pattern and development of European slave trade routes, the African slave merchant class
 3. The Islāmic revolutions in the western Sudan: spiritual and military leadership of Sīdī Mukhtār (d. 1811) and Usman dan Fodio (d. 1817), the Fulani and Hausa *jihāds* (holy wars) and conquests
 4. West Africa from 1800 to c. 1885
 - a. The Guinea coastlands and the European antislavery movements
 - b. British colonial settlements from c. 1800: the colonies of Sierra Leone, the Gold Coast, Lagos, and Ashanti
 - c. 19th-century British and French exploration of the West African interior, establishment of colonies, and exploitation of trade

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with West Africa to c. 1885

Africa
Western Africa

MICROPAEDIA: Selected entries of reference information

General subjects

Akan states	British West Africa	Hausa states	Songhai empire
Akwamu	Dahomey	Kanem-Bornu	Tukulor empire
Ashanti empire	Djénné	Kumbi	Wolof empire
Audaghost	Fanti confederacy	Mali	
Bambara states	French West Africa	Mossi states	
Benin	Fulani empire	Oyo empire	
Bono			

Biographies

Agaja	Mūsā	Sonni 'Alī
Beecroft, John	Osei Tutu	Sumanguru
Faidherbe, Louis	Park, Mungo	Sundiata
Muhammad I	Rābiḥ az-Zubayr	'Umar Tal
Askia	Samory	Usman dan Fodio

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Section 942. The Nilotic Sudan and Ethiopia from c. AD 550 to 1885**A. The Nilotic Sudan from c. 550 to 1885**

1. The medieval Christian kingdoms of Nobatia, Maqurrah, and 'Alwah; the Beja people
2. The spread of Muslim domination from c. 639; Mamlūk attacks in the 13th and 14th centuries, invasion of nomadic Arabs in the 15th century and intermarriage with Nubians, kingdom of 'Alwah as the last Christian barrier until its conquest (c. 1500)
3. The rise of the Funj (c. 1500), the spread of Islām
4. The Egyptian occupation from 1820 to 1885: the administration of Muḥammad 'Alī and his successors, Ismā'īl Pasha and the growth of British influence

B. Ethiopia and Eritrea from c. AD 650 to 1855

1. The decline of the Christian Aksum empire (c. 600–c. 976); cordial relations with Islāmic states to the 8th century, conflicts with neighbouring peoples in the 9th century
2. The Zagwe dynasty (c. 12th–13th century), the Solomonid restoration (1270), the influence of the Coptic Church on culture and religion
3. Contacts with the Portuguese (1520–c. 1632), Muslim invasion under Aḥmad Grāñ (1531–43) and establishment of Turkish garrisons in the 16th century, brief conciliation with the Roman Catholic Church (early 17th century)
4. Gonder Ethiopia (1632–1855): alliance with Egyptian Coptic Church, friendly relations with Muslims, rivalry between the Oromo and Tigrayans

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the Nilotic Sudan and Ethiopia from c. AD 550 to c. 1885

Africa
 Eastern Africa
 Sudan, The

MICROPAEDIA: Selected entries of reference information

General subjects

Adal	Ethiopia	Kordofan
Aksum	Funj dynasty	Sudan, The
Darfur	Ifat	Zagwe dynasty

Biographies

Aḥmad Grāñ	Ewostatewos	Mahdī, al-	Sahle Selassie
Amda Tseyon	Gordon, Charles	Mikael Sehul	Yohannes IV
Covilhã, Pêro da	George		

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Section 943. East Africa and Madagascar to c. 1885

- A. The geography and ethnography of East Africa and Madagascar: definition of the region, the archaeological and documentary historical sources and historiographic problems, the character and achievements of civilizations in East Africa
- B. East Africa to c. 1856 and Madagascar to c. 1810
 1. The development of the coastal regions and of Madagascar and other offshore islands
 - a. Medieval commercial contacts of Azania with Arabia, India, and the Mediterranean: the development of coastal trading cities
 - b. The Shirazi dynasty (c. late 12th–15th century): the spread of Islām and growth of towns
 - c. The Portuguese invasions and occupation from 1502: gradual expulsion of the Portuguese (1631–98), the Omani influence (c. 1700–1856)
 - d. Madagascar from c. AD 1000 to 1810: early Indonesian settlement, later Muslim and African influx, kingdoms of Sakalava and Merina (1500–1810)
 2. The peoples and states of the East African interior to c. 1800
 - a. The Stone Age origins of the East African interior peoples in the Rift Valley (now Kenya, Tanzania, and Uganda)
 - b. The Iron Age settlements in the Rift Valley, the Bantu migrations and the Chwezi peoples
 - c. The Somali and Galla invasions (c. 10th–15th century), migrations of Nilotic and Kushitic peoples (c. 16th–18th century)
- C. East Africa from 1856 to c. 1900 and Madagascar from 1810 to 1896
 1. Internal developments in East Africa
 - a. Development of political institutions and military kingships as defenses against Ngoni raids and Masai raiders: expansion of Rwanda and Buganda
 - b. The rise of Zanzibar as the leading East African coastal power: the slave trade
 - c. European exploratory and missionary activities
 2. Formation of the Kingdom of Madagascar (1810–61), English and French influences in the late 19th century

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with East Africa and Madagascar to c. 1885

Africa
Eastern Africa

MICROPAEDIA: Selected entries of reference information

General subjects

Boina	Bunyoro	Merina	Somaliland
Buganda	Menabé	Sakalava	Zanzibar

Biographies

Barghash	Livingstone, David	Mutesa I	Zwangendaba
Kirk, Sir John	Mirambo	Sa'id ibn Sulṭān	

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Section 944. Central Africa to c. 1885

- A. The geography and ethnography of Central Africa, definition of the region, the archaeological and documentary historical sources and historiographic problems, the character and achievements of civilizations in Central Africa
- B. Central Africa to c. 1885
 1. The origins of Central African cultures in the Stone Age, emergence and expansion of the Bantu-speaking peoples
 2. The development of the Bantu states from c. AD 1400: the Kongo kingdom, the Luba and Lunda kingdoms, the Mongo people
 3. Development of Portuguese hegemony over Central Africa from the 1470s: trade and missionary activity, military support of the Kongo kingdom, control of the slave trade, influence on Central African unity

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with Central Africa to c. 1885

Africa
Central Africa

MICROPAEDIA: Selected entries of reference information

General subjects

Anziku, Kingdom of	Berlin West Africa	Kongo kingdom	Luba-Lunda states
Association	Conference	Kuba	Lunda empire
Internationale	Congo Free State	Loango,	Ngoy
Africaine	Kakongo	Kingdom of	Wadai
Bagirmi,	Kazembe		
Kingdom of			

Biographies

Afonso I	Livingstone, David
Brazza, Pierre-	Msiri
Paul-François-	Stanley, Sir Henry
Camille	Morton
Savorgnan de	Tippu Tib

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- A. The geography and ethnography of southern Africa: definition of the region, the archaeological and documentary historical sources and historiographic problems, the character and achievements of civilizations in southern Africa
- B. Southern Africa before c. 1500
 1. Origins of mankind and development of culture in the Stone Age and Iron Age, the migrations of Bantu-speaking peoples in southern Africa from c. AD 200–400
 2. The southeast coast trade in the Late Iron Age and interior trade routes to Mapungubwe (northeastern South Africa), Great Zimbabwe (southeastern Zimbabwe), and Ingombe Ilede (Zambia)
- C. Southern Africa from c. 1500 to c. 1885
 1. Portuguese expansion (1530s) into the Zambezi valley and defeat of the Mwene Mutapa's empire in 1629: Portuguese defeats (1690s) by the Rozwi empire
 2. The Portuguese in west central Africa: conquests over the Kongo kingdom (1665) and the Ndongo kingdom (1671), control of the slave trade
 3. The Dutch settlement at the Cape of Good Hope from 1652: expansion toward the Orange River and subjugation of the Khoisans

4. Early 19th-century African migrations and rise of the Zulu Empire (1816) under Shaka, later black migrations into Rhodesia
5. The slave and ivory trade north of the Zambezi in the 19th century: decline of the slave trade in some areas and increased commerce in ivory, Yao migration into present-day Malawi, influence of missionaries
6. The Cape eastern frontier: Boer and Xhosa resistance to the British, the Boer Great Trek (1835–54) into the interior, continued friction with the British
 - a. Relations between Boers and the black population in the Transvaal
 - b. Establishment of the Orange Free State, the British colonies of Natal and Cape Colony
7. The era of mineral discoveries and confederation: diamonds and gold, Transvaal–Pedi and Zulu wars
8. Portuguese loss of control in Angola and Mozambique in the mid-19th century, Portuguese reemergence of control in the early 20th century, German annexation of South West Africa (1884)

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with Southern Africa to c. 1885

Africa

Southern Africa

MICROPAEDIA: Selected entries of reference information

General subjects

Afrikaner Bond	Gun War	Maravi	Rozwi
Blood River,	Imbangala	Confederacy	Sand River and
Battle of	Isandhlwana and	Matamba	Bloemfontein
Cape Frontier	Rorke's Drift,	Mfecane	conventions
Wars	Battles of	Mozambique	uitlanders
Gaza	Kaffraria	Conventions	Zimbabwe
Great Trek	Kasanje	Mwene Matapa	Zulu War
Griqua	Lunda empire	Ndongo	Zululand

Biographies

Brand, Sir	Gungunhana	Mswati	Rhodes, Cecil
Johannes	Joubert, Petrus	Mzilikazi	Robinson, Sir
Henricus	Jacobus	Philip, John	Hercules
Burgers, Thomas	Kruger, Paul	Potgieter, Hendrik	Sebetwane
François	Livingstone, David	Pretorius, Andries	Shaka
Cetshwayo	Lobengula	Pretorius,	Shepstone, Sir
D'Urban, Sir	Mackenzie, John	Marthinus Wessel	Theophilus
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Division V. Peoples and Civilizations of Pre-Columbian America

[For Part Nine headnote see page 343.]

The subject in Section 951 is Andean civilization to *c.* 1540. The outline begins with the character and achievements of Andean civilization, with the ethnography and geography of the Andean region, and with archaeological and documentary historical sources. It goes on to the history of the pre-Inca cultures and states in the Andean region. It then deals with the empire of the Incas to the time of the Spanish conquest (1532–40).

The subject in Section 952 is Meso-American civilization to *c.* 1540. The outline begins with the geography and ethnography of Meso-America and with the character and achievements of Meso-American civilization. It goes on to the history of Meso-American civilizations until their conquest and destruction by the Spanish.

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Section 951. Andean Civilization to *c.* AD 1540

- A. The character and achievements of Andean civilization, the geography and ethnography of the Andean region, archaeological and documentary historical sources, historiographic problems
- B. Pre-Inca cultures and states
 1. Late Preceramic (*c.* 3500–*c.* 1800 BC) cultures: development of agriculture
 2. Initial (*c.* 1800–*c.* 1000 BC) and Early Horizon, or Chavín and Paracas (*c.* 1000–*c.* 200 BC), cultures in Peru: development of textiles, pottery, and ceremonial architecture
 3. Early Intermediate (Florescent, or Classic) Period (*c.* 200 BC–*c.* AD 600): metallurgy, pottery, and textile production in the Nazca and Moche cultures
 4. Middle Horizon Period (*c.* AD 600–*c.* 1000): the Huari and Tiahuanaco cultures, urban settlements, cultural decline after *c.* AD 800
 5. Late Intermediate Period (*c.* AD 1000–*c.* 1400): pottery and the introduction of bronze, the Chimú Empire (*c.* 1300–*c.* 1460) located at Chan Chan, spread of urban settlements
- C. The empire of the Incas (*c.* 1400–*c.* 1540)
 1. The origins and development of the Inca Empire
 - a. The autochthonic mythical origins of the Inca dynasty, establishment of the Cuzco Valley settlement (*c.* 1400)
 - b. The reigns of Capac Yupanqui, Inca Roca, Yahuar Huacac, and Viracocha Inca: Inca expansion into the Urubamba Valley and Titicaca Basin, the Chancas invasion (1438)
 - c. Inca victory over the Chancas (1438), Incan civil war between Cuzco and Calca factions, Cuzco victory and reign of Pachacuti Inca Yupanqui (1438–*c.* 1471), renewed battles with Chancas (*c.* 1445), further conquest of Titicaca Basin region, victory over Chimú Empire
 - d. Inca conquests during the reign of Topa Inca Yupanqui (*c.* 1471–*c.* 1493): annexation of highland Bolivia, northern Chile, northwestern Argentina, and southern Peru
 - e. Reign of Huayna Capac (*c.* 1493–*c.* 1525): conquest of northeastern Peru and northern Ecuador, Atahualpa's victory (1532) over Huascar in civil war
 - f. The Spanish conquest of the Incas (1532–40): Pizarro's execution of Atahualpa and support of Topa Huallpa (1533), later support of Manco Inca (1533–35); Manco's rebellion and defeat (1536), Spanish consolidation of power
 2. Incan government, society, and culture
 - a. Divine monarchy and the royal corporations, administrative hierarchy, taxation, the census and the quipu system of numerical records
 - b. The settlement of people loyal to the Incas in newly conquered territories, the spy system, religious practices, military policy and organization, technology, agriculture, transportation system, calendar, oral narratives

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with Andean civilization to c. AD 1540

Argentina	Latin America, The History of
Bolivia	Lima
Chile	Peru
Colombia	Pre-Columbian Civilizations
Ecuador	

MICROPAEDIA: Selected entries of reference information

General subjects

Andean civilization	Chavín	Inca	Pachacamac
Araucanian	Chimú	Machu Picchu	Paracas
Atacama	El Paraíso	Moche	Quechua
Chan Chan	Huari	Nazca	Tiahuanaco

Biographies

Almagro, Diego de	Huascar	Pizarro, Gonzalo
Atahualpa	Pizarro, Francisco	

INDEX: See entries under all of the terms above

Section 952. Meso-American Civilization to c. AD 1540

- A. The character and achievements of Meso-American civilization, the geography and ethnography of Meso-America, archaeological and documentary historical sources, historiographic problems
- B. Meso-America in the Pre-Classic and Classic periods
 1. The development of Meso-American civilization in the Pre-Classic periods
 - a. Late Pleistocene and Early Hunter (c. 21,000–c. 6500 BC) peoples of Meso-America, development of agriculture (c. 6500–c. 1500 BC)
 - b. Early Formative Period (c. 1500–c. 900 BC): the Ocós and Caudros settlements, the Olmec civilization at San Lorenzo (c. 1150–c. 900 BC) and development of its stone monuments
 - c. Middle Formative Period (c. 900–c. 300 BC): the Olmecs at La Venta (c. 800–c. 400 BC); ceremonial architecture, pottery, and writing system; colonization and trade; pre-Maya villages in Guatemala
 - d. Late Formative Period (c. 300 BC–c. AD 100): regionalism and cultural integration, the Cuicuilco-Tilcomán cultures in the Valley of Mexico, the Zapotecs of Oaxaca, the Izapan civilization, Mayas of the Chicanel in northern Petén
 2. Maya and non-Maya Meso-America in the Classic Period (c. AD 100–c. 900)
 - a. Early Classic Period (c. AD 100–c. 600)
 - i. Teotihuacán cultural and urban development, ceremonial architecture and pottery, the Zapotecs at Monte Albán
 - ii. The Cotzumalhuapo culture in the Maya highlands, Tzakol and Tepeu cultures in lowland Maya civilization (c. AD 300–c. 900)
 - b. Late Classic non-Maya Meso-America (c. AD 600–c. 900): decline of Teotihuacán political and cultural influence, rise of Xochicalco culture, the Mixtecs of northern Oaxaca
 - c. Late Classic lowland Maya culture (c. AD 600–c. 900)
 - i. Urban settlements, temple-pyramids and palaces, Maya art, the calendar and writing system
 - ii. Maya religion, social and political life, the collapse of the Maya civilization (c. AD 900)
- C. Post-Classic Period in the Valley of Mexico and the Yucatán Peninsula (c. 900–c. 1519)
 1. The rise and decline of the Toltec state in southern Mexico and the Yucatán Peninsula (c. 900–c. 1200): secular and religious institutions, art and architecture, the legend of Quetzalcóatl, Toltec–Maya culture of Tollan (Tula) and Chichén-Itzá

2. The development of the Aztec state and extension of Aztec rule over the Valley of Mexico (c. 1325–1519): military campaigns of Itzcoatl, Montezuma I, and Ahuitzotl; administrative techniques under Montezuma II (1502–20)
 3. Aztec culture and society up to the time of the Spanish conquest; *e.g.*, agriculture and technology, political organization, governmental structure, militarism, economy, religion, art and architecture
- D. The Spanish conquest of the Aztec state and the Yucatán Peninsula (1519–c. 1540): destruction of Aztec government and culture, imposition of Spanish colonial policies and religion

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with Meso-American civilization to c. AD 1540

Latin America, The History of
Mexico
Mexico City
Pre-Columbian Civilizations

MICROPAEDIA: Selected entries of reference information

General subjects

<i>cultural centres:</i>	Palenque	<i>peoples:</i>	Yucatec Maya
Chapultepec	Teotihuacán	Chichimec	Zapotec
Chichén Itzá	Texcoco	Chol	<i>other:</i>
Dos Pilas	Tikal	Lacandón	Aztec calendar
Kaminaljuyú	Tula	Maya	Mayan calendar
Mayapán	Uxmal	Olmec	Quetzalcóatl
Mitla	Xochicalco	Toltec	
Monte Albán			

Biographies

Alvarado, Pedro de	Cuauhtémoc
Cortés, Hernán,	Griljalba, Juan
marqués del Valle	Marina
de Oaxaca	Montezuma II

INDEX: See entries under all of the terms above

Division VI. The Modern World to 1920

[For Part Nine headnote see page 343.]

The theme of western expansion, imperialism, and colonialism pervades Division VI. The separation of the history of the modern world (c. 1500–c. 1920) into eleven sections reflects conventional regional analyses of modern history, and, within each of those sections, conventional judgments regarding turning-point dates of the regional histories.

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962. Eastern Europe, Southwest Asia, and North Africa from c. 1480 to c. 1800 406

963. Europe from 1789 to c. 1920 408

964. European Colonies in the Americas from 1492 to c. 1790 420

965. Development of the United States and Canada from 1763 to 1920 422

966. Development of the Latin-American and Caribbean nations to c. 1920 428

967. Australia and Oceania to c. 1920 433

968. South Asia Under the Influence of European Imperialism from c. 1500 to c. 1920 434

969. Southeast Asia Under the Influence of European Imperialism to c. 1920 436

96/10. China from 1839 Until the Onset of Revolution (to c. 1911), and Japan from the Meiji Restoration to c. 1910 438

96/11. Southwest Asia and North Africa (c. 1800–1920), and Sub-Saharan Africa (1885–c. 1920) Under the Influence of European Imperialism: the Early Colonial Period 440

Section 961. Western Europe from c. 1500 to c. 1789

- A. The effects of religious and cultural change: the emergence of the nation-state system, the predominance and decline of Habsburg power centred in Spain (c. 1500–1648)
 1. The later Renaissance in Italy and northern Europe
 - a. The influence of Italian statecraft and political theory: Machiavelli and the principle of *raison d'état*
 - b. Cultural and intellectual life in the later Renaissance
 2. The Scientific Revolution: the emergence of modern science and technology in the 16th and 17th centuries
 3. The emergence of a religiously divided Europe in the 16th century
 - a. The Protestant Reformation and its political and social consequences
 - b. The Catholic Reformation and Counter-Reformation
 4. International diplomacy and warfare (1494–1648)
 - a. The Italian Wars (1494–1516) and the concept of balance of power: French and Austro-Spanish expansionism in Italy
 - b. French and Austrian struggles for supremacy in Europe (1515–59): French anti-Habsburg alliances with England, German Lutheran princes, and the Turks
 - c. Conflicts between Catholic and Protestant powers after c. 1555: religious wars in France and the Low Countries, conflict with the Ottoman Empire
 - d. The Thirty Years' War (1618–48) and the Peace of Westphalia: the end of religious struggles and resecularization of international affairs
 5. National and dynastic states (c. 1500–1648)
 - a. Italy in the 16th and 17th centuries: political, economic, social, and cultural developments
 - i. The French invasion (1494) and conquests of Naples (1495) and Milan (1499), the influence of Savonarola, the anti-French League of Venice and the Spanish defeat of France (1525)
 - ii. Italy under Spanish domination: Catholic religious reforms; Spanish Habsburg rule in Naples, Sicily, Sardinia, and Milan
 - iii. Relations between Spain and the independent states of Italy: Savoy, Genoa, Tuscany, Venice, and the Papal States
 - b. Spain from 1516 to 1665
 - i. Establishment of the Habsburg dynasty (1516) by Charles I (Holy Roman Emperor Charles V), Spanish hegemony in Europe and the Americas, domestic and foreign policies of Philip II (1556–98), the Armada (1588), cultural developments in Spain's Golden Age
 - ii. Political and economic decline during the reigns of Philip III (1598–1621) and Philip IV (1621–65): expulsion of the Moriscos (1609), Olivares' administration, loss of Portugal (1640)
 - c. Portugal from c. 1500 to 1640: domination of East Indian trade, union with Spain (1580), independence under House of Bragança (1640)
 - d. The British Isles (c. 1485–1649)
 - i. Henry VII (1485–1509): dynastic unity in England after the Wars of the Roses; political, judicial, social, and economic developments
 - ii. Henry VIII (1509–47): foreign and domestic policies; the divorce question, the English Reformation, and the establishment of the Church of England; Edward VI (1547–53) and Mary I (1553–58)
 - iii. Elizabeth I (1558–1603): social and cultural developments; domestic policies; dynastic challenge of Mary, Queen of Scots; struggle with Spain
 - iv. James I (1603–25) of England (James VI of Scotland) and establishment of the Stuart dynasty: developments in religious doctrine, foreign relations, economic policy, and the arts; conflicts between crown and Parliament

- v. Charles I (1625–49) and the English Civil War (1642–51): economic and political disputes between crown and Parliament; royal personal rule (1629–40); persecution of Puritans; the Long Parliament, Oliver Cromwell, and the Civil War; execution of Charles I (1649)
- vi. Scotland in the 16th and 17th centuries: reigns of James IV and James V; Mary, Queen of Scots (1542–67), and the Scottish Reformation; John Knox and Calvinism; James VI (1567–1625) of Scotland (James I of England, 1603–25) and personal union of the two crowns
- vii. Ireland in the 16th and 17th centuries: subjugation of Ireland by Henry VIII and Elizabeth I, the Irish revolt of 1641, Cromwell's invasion and anti-Catholic policies during the Commonwealth
- e. France from 1483 to 1643
 - i. Development of a standing army and a professional bureaucracy in the reigns of Charles VIII (1483–98), Louis XII (1498–1515), Francis I (1515–47), and Henry II (1547–59)
 - ii. The Protestant Reformation and the French Wars of Religion (1562–98): the reigns of Catherine de Médicis (1560–74) and Henry III (1574–89), religious compromise and restoration of strong monarchy under Henry IV of Bourbon (1589–1610)
 - iii. The reign of Louis XIII (1610–43) and Cardinal de Richelieu: suppression of the Huguenots and the nobles, French success in the Thirty Years' War
- f. Germany and the Holy Roman Empire from c. 1500 to 1648: the Reformation, Counter-Reformation, and Thirty Years' War
 - i. Maximilian I (1493–1519), Martin Luther, and the origins of Lutheranism; Charles V and the Diet and Edict of Worms (1521); the Peasants' Revolt (1524–25); diets of Speyer (1526 and 1529) and Augsburg (1530); the Schmalkaldic League and ensuing wars; abdication of Charles V (1555) and Peace of Augsburg
 - ii. Ferdinand I (1556–64) and Maximilian II (1564–76), internal disunity under their successors, the Thirty Years' War (1618–48), political and religious settlements of the Peace of Westphalia (1648)
- g. The Swiss Confederation from 1474 to 1648
 - i. Swiss victory over Charles the Bold in the Burgundian War (1474–77), military prestige of the confederation, victory over Maximilian I (1499), the Italian campaigns (1499–1516)
 - ii. The Swiss Reformation: Zwingli and Calvin, the Counter-Reformation and emergence of Catholic and Protestant cantons, neutrality in the Thirty Years' War (1618–48), European recognition by the Peace of Westphalia (1648)
- h. The Low Countries from 1494 to 1648
 - i. Habsburg unification of the Low Countries (1494); further consolidation under the future emperor Charles V (1506–55); economic, cultural, and religious developments; revolt of the provinces (1567–79)
 - ii. Establishment of the United Provinces of the Netherlands (the Dutch Republic) in 1579; leadership of the House of Orange, continued war against Spanish Habsburg power
 - iii. Commercial supremacy of the Dutch Republic, intermittent wars with Spain (1621–48)
 - iv. Cultural, social, religious, and economic developments in the Dutch Republic
- i. Scandinavia from 1523 to 1648: separation of Sweden from Denmark–Norway (1523) and Dano-Swedish conflicts; Christian III of Denmark (1534–59), Gustav I Vasa (1523–60), and Gustavus II Adolphus (1611–32) of Sweden; participation in Thirty Years' War (1618–48)
- B. European overseas expansion and commercial development from c. 1400 to 1763
 - 1. The beginning of European imperialism: rapid expansion of European trade with and control over the non-European world after c. 1450
 - a. Advances in geographical knowledge and technological improvements; *e.g.*, ship design, navigational instruments, cartography
 - 2. Voyages of discovery and exploration: establishment of colonial empires
 - i. Discovery, exploration, and early settlement of the Americas

- ii. Discovery, exploration, and early settlement of the coastal regions of Africa, Australia, India, and the East Indies
- 2. The decline of the feudal system and growth of commercial activity
 - a. The changing relationship between tenant and landlord, agricultural developments, evolving role of the guilds, decline of Hanseatic League, demographic movements
 - b. The decline in Mediterranean trade and growth of Antwerp and Amsterdam as international trade centres, the growth of a landed merchant class
- 3. Technological advances and pre-Industrial Revolution manufacturing systems: development of "putting-out" system and decline of guild power
- 4. The impact of colonial expansion on Europe
 - a. Economic effects
 - i. Development of new business organizations to direct colonial exploitation: joint-stock and chartered companies
 - ii. The "price revolution": the relationship between the influx of precious metals from the Americas to Europe and the price rise in the 16th century
 - iii. Growth of mercantilism: theories and policies of economic nationalism developed by European powers, the concept of the balance of trade
 - iv. Increase in volume of world trade: the growth of the luxury trade (silks, spices, precious metals), the agricultural trade (tobacco, sugar, and coffee), the raw materials trade
 - v. Development and importance of the slave trade
 - b. Political effects: the relationship between Spain's status as an international power and its colonial possessions in the 16th century, colonial rivalries among European powers in the 17th and 18th centuries
- C. France and Great Britain as the dominant powers in Europe, the emergence of Prussia and Austria as European powers
 - 1. International wars and diplomacy (c. 1649–c. 1790)
 - a. The Age of Louis XIV (1661–1715): French successes in the War of Devolution (1667–68) and the Dutch War (1672–79), defeat in the War of the League of Augsburg (1689–97) and the War of the Spanish Succession (1701–14)
 - b. Development of the alliance system: the balance of power
 - i. The Quadruple Alliance: the emergence of Prussia and Austria as European powers, the War of the Austrian Succession (1740–48)
 - ii. The Seven Years' War (1756–63) and France's defeat and loss of colonial territory in the Americas
 - iii. French recovery and Franco-Spanish cooperation (1778–81) against Britain in the U.S. War of Independence, Russian-Prussian partition of Poland (1772)
 - 2. The European states (c. 1648–c. 1790)
 - a. Great Britain from 1649 to c. 1790
 - i. Oliver Cromwell, the Commonwealth, and the Protectorate (1649–60); the Stuart Restoration (1660) under Charles II (1660–85) and James II (1685–88); the Glorious Revolution of 1688 and end of crown rule without Parliament
 - ii. Limited monarchy under William III (1689–1702) and Mary II (1689–94) and Anne (1702–14); growth of Whig and Tory political parties (1689–1714); the Hanoverian succession and emergence of the cabinet system under George I and George II; Whig supremacy and political stability to 1760; ministries of Walpole, Pelham, and Pitt
 - iii. Early years of George III's reign (1760–1820) to c. 1790: eclipse of Whig power and political instability (1760–70), failure of colonial policies and U.S. War of Independence, beginning of parliamentary and reform movements
 - iv. Economic, cultural, and social developments: agricultural innovations, population growth, origins of the Industrial Revolution and factory system, influence of Methodism
 - v. Formal union of England and Scotland (1707), Edinburgh's status as an intellectual centre, Protestant Ascendancy in Ireland and growth of Irish patriotism among the Anglo-Irish, Wales in the 18th century
 - b. France from c. 1650 to c. 1790

- i. The Fronde, Louis XIV's minority (1643–61), and Mazarin's control of government to 1661
 - ii. The Age of Louis XIV (1661–1715): development of the central government, the Versailles court, military policies, mercantilist policies of Colbert
 - iii. Louis's religious and political policies: revocation (1685) of the Edict of Nantes and the Huguenot emigration, political influence of Jansenism, royal absolutism
 - iv. French cultural development in the 17th century
 - v. The *ancien régime* (1715–89): the close relationship between society and the state, the new urban class, the decline of the monarchy under Louis XV (1715–74) and Louis XVI (1774–92), power of the *parlements*, agricultural and industrial growth, domestic and colonial trade
 - vi. The reform movement: the influences of nationalism and individualism; attacks on political, social, and economic policies of the *ancien régime*; conflict between the nobility and bourgeoisie; the financial crisis and attempts at reform by Necker and Turgot; the States General and the beginning of the Revolution (1789)
- c. The lands ruled by the Austrian Habsburgs (1648–1790)
- i. Austrian consolidation and expansion under Leopold I (1658–1705), Joseph I (1705–11), and Charles VI (1711–40): conquest of Hungary and penetration of the Balkans in the Austro-Turkish wars (1683–99 and 1716–18), War of the Spanish Succession (1701–14) and acquisition of the Spanish Netherlands (1713)
 - ii. The Pragmatic Sanction and the accession of Maria Theresa (1740); War of the Austrian Succession (1740–48) and loss of Silesia to Prussia (1741); military, administrative, and educational reforms of Maria Theresa; acquisition of Polish Galicia (1772); failure of Joseph II's (1765–90) foreign policies and his enlightened domestic reforms (1780–90)
- d. Germany and the rise of Prussia (c. 1640–c. 1790)
- i. Frederick William, the Great Elector (1640–88): strengthening of Hohenzollern power in Brandenburg and Prussia, end of Polish suzerainty over Prussia, War of the Spanish Succession (1701–14), Austro-Prussian rivalry in the 18th century, Frederick I (1701–13) and Frederick William I (1713–40) of Prussia
 - ii. Frederick II the Great (1740–86): War of the Austrian Succession (1740–48), Seven Years' War (1756–63), partitions of Poland (1772–95), development of Idealism (Kant), enlightened reform and benevolent despotism
 - iii. The influence of Pietism, the German cultural revival in the second half of the 18th century
- e. Spain and Portugal
- i. Spain from 1665 to c. 1790: continued decline under Charles II (1665–1700); War of the Spanish Succession (1701–14) and establishment of the Bourbon dynasty; pro-French foreign policy under Philip V, Ferdinand VI, and Charles III; administrative and economic reforms of Charles III
 - ii. Portugal from 1640 to c. 1777: increasing economic and diplomatic ties to England under John IV (1640–56), Afonso VI (1656–83), Pedro II (1683–1706), and John V (1706–50); economic, religious, and administrative reforms under Pombal and Joseph I (1750–77)
- f. Italy in the 18th century
- i. Government reforms and the rule of Joseph II (1765–90) in Lombardy, reigns of Francis of Lorraine (1738–65) and Peter Leopold (1765–90) in Tuscany
 - ii. The vicerealty of Naples and the kingdom of Sicily: economic and social unrest, rule of Charles VI in Sicily, transfer of Naples and Sicily to Charles III in 1734, the Bourbon regime
- g. The United Provinces of the Netherlands from 1648 to 1789; economic and political stagnation; the first (1650–72) and second (1702–47) stadholderless periods; the patriotic movement; social, religious, and cultural development
- h. Scandinavia from c. 1648 to c. 1792
- i. Swedish wars of conquest against Poland and Denmark–Norway under Charles X Gustav (1654–60) and Charles XI (1672–97), war with Russia under Charles XII (1697–1718) and displacement of Sweden by Russia as the chief Baltic power after the Great Northern War (1700–21)

- ii. Social and economic conditions in the Scandinavian countries
- iii. Denmark–Norway losses in the First Northern War with Sweden (1655–60); economic stagnation (1720–66), “Enlightened” reforms under Christian VII (1766–1808), Struensee, and Bernstorff; revival of settlement in Greenland (1714)
- iv. Growth of parliamentary government in Sweden: Frederick I (1720–51) and Adolf Frederick (1751–71), the “Hats” and “Nightcaps” political parties, absolutism reestablished by Gustav III (1771–92)
- i. The Swiss Confederation (c. 1650–1790): Villmergen wars (1656–1712), the influence of the Enlightenment
- 3. The age of the Enlightenment
 - a. Origins in the 17th century: scientific achievements, developments in political and religious philosophies, developments in the arts
 - b. Expansion in the 18th century: the spread of religious, political, economic, and scientific theories in western Europe; cultural developments

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with western Europe from c. 1500 to c. 1789

Amsterdam	Czech and Slovak	Geneva	Madrid
Antwerp	Republics	Germany	Malta
Arctic, The	Denmark	Greece	Manchester
Athens	Dublin	Habsburg, The	Marseille
Austria	Edinburgh	House of	Milan
Bacon, Francis	Elizabeth I of	Hamburg	Naples
Balkan States	England	Holy Roman	Netherlands, The
Barcelona	European History	Empire, The	Norway
Belgium	and Culture	History of the	Paris
Berlin	European Overseas	Hungary	Portugal
Bourbon, The	Exploration and	Iceland	Rome
House of	Empires, The	Ireland	Spain
Brussels	History of	Italy	Sweden
Cologne	Finland	Lisbon	Switzerland
Columbus	Florence	London	United Kingdom
Cromwell, Oliver	France	Luther	Venice
	Frederick the Great	Luxembourg	Vienna

MICROPAEDIA: Selected entries of reference information

General subjects

<i>cultural and</i>	Bavarian	Medina del	Russo-Turkish
<i>economic:</i>	Succession,	Campo, Treaty of	Wars
Baroque period	War of the	Mohács, Battle of	Seven Years' War
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Classicism and	Blenheim, Battle of	Nordlingen,	Spanish
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Enlightenment	Cambrai,	Northern War,	of the
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<i>international</i>	Peace of	Battle of	Westphalia,
<i>relations:</i>	Devolution,	Paris, Treaty of	Peace of
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Suggested reading in the *Encyclopædia Britannica*:

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Afghanistan	Cairo	Istanbul	Saint Petersburg
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 - ii. Political and social reform measures (1822–48); *e.g.*, penal reforms, Catholic Emancipation (1829), Peel’s new police force (1829), First Reform Bill (1832), abolition of slavery in British colonies (1833), new Poor Law (1834), repeal of the Corn Laws (1846), Navigation Acts, the Chartist movement, the growth of trade unionism and the Factory Act (1847), Public Health Act (1848)
 - iii. Developments in Ireland: the Great Famine of the 1840s, Roman Catholic unrest, O’Connell and the Young Ireland movement
- j. France from 1814 to 1852
 - i. The Restoration (1814, 1815–30): moderate constitutionalism under Louis XVIII, reaction and clericalism under Charles X
 - ii. The Revolution of 1830, Louis-Philippe and the July monarchy, the preservation of the status quo under Guizot, growing dissatisfaction with the regime in the 1840s
 - iii. The Revolution of 1848: Socialist thought and the establishment of the Second Republic, suppression of Socialist experiments, presidency of Louis-Napoléon
- k. Germany from 1815 to c. 1850
 - i. The German Confederation: Austrian domination under Metternich, the student national unity movement and its repression by the Carlsbad Decrees (1819), beginning of industrialization and the Zollverein
 - ii. The revolutions of 1848–49: the Frankfurt National Assembly and its failure to unite Germany
 - iii. Frederick William IV: restoration of the German Confederation, return to conservative policies, continued industrialization
- l. The Austrian Empire from 1815 to 1850
 - i. Development of national consciousness among the peoples of the empire: cultural revival among Magyars, Croats, Serbians, Poles, Romanians, Czechs, Slovaks, and Slovenes; German and Italian nationalism
 - ii. Metternich’s hostility to liberalism: Austria as a symbol of reaction in Italy
 - iii. The revolutions of 1848 and 1849 in Vienna, Prague, and Budapest
- m. The Italian states from 1815 to 1850
 - i. The Vienna settlement: the Austrian Habsburgs in Lombardy–Venetia, the Bourbons in the Two Sicilies, Victor Emmanuel in Savoy, the Carbonari

- ii. Abortive revolutions in Naples and Piedmont (1820); economic slump and revival; rebellions in Modena, Parma, the Romagna, the Marches, and Umbria (1831)
 - iii. The *Risorgimento*: Mazzini, Young Italy, and Young Europe; the early liberalism of Pope Pius IX
 - iv. The revolutions of 1848: the first phase of the Italian War of Independence, defeat of Piedmont by Austria (1848–49)
 - n. Switzerland from 1815 to 1860: conservative constitution of 1815, the Sonderbund War (1847), the new federal state established (1848–60), policy of neutrality
 - o. Russia from 1815 to c. 1850: later conservatism of Alexander I, the Decembrist revolt (1825), Nicholas I's (1825–55) conservative policies
 - i. Rule by bureaucracy, social classes, intellectual life, the empire and its various nationalities
 - ii. Foreign policy: conflict with Poland, relations with Turkey
 - p. The Low Countries from 1814 to 1848: union of The Netherlands, Luxembourg, and Belgium (1814); Belgian Revolution (1830) and establishment as a separate monarchy under Leopold I (1831–65); constitutional reform (1848) in The Netherlands
 - q. Spain and Portugal from 1815 to 1850
 - i. Spain under Ferdinand VII, revolution and abortive liberal government (1820–23), loss of South American empire (1820s), Isabella II and the succession dispute, First Carlist War (1833–39) and the “Spanish marriages” controversy
 - ii. Portuguese loss of Brazil (1822), civil war between constitutionalists and absolutists (1832–34), British intervention (1826–34), Maria II (1834–53) and civil strife between Septembrists and Saldanha
 - r. Scandinavia from 1815 to 1850
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 - ii. Developments in Sweden-Norway: conservative era under Charles XIV John (1818–44), liberal reforms after 1840 and under Oscar I (1844–59), Norway's struggle to assert independence from Sweden
 - iii. Finland and Iceland: Finnish political organization and Russian influence, the position of Iceland after the Treaty of Kiel (1814)
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 - i. Serbian uprising (1804–13) and the rise of the principality, restoration of Ottoman power in Serbia (1813–15), Serbian autonomy (1830) under Ottoman Empire, Miloš Obrenović recognized as prince of Serbia (1833–39) and government of Alexander Karageorge (1842–58)
 - ii. Greek revolution (1821–30) and establishment of independence, internal strife under Otho I (1832–62), constitutional government introduced in 1843
- B. Realism and materialism, nationalism, the reorganization of Europe, imperialist expansion (1850–c. 1920)
- 1. European cultural and economic life from 1850 to 1920
 - a. Philosophy and political and social thought: the prevalence of Determinism and Materialism
 - b. Developments in the arts, philosophy, and religion
 - c. Scientific theory and practice: Einsteinian relativity, the social effects of medical advances, development of the behavioral sciences, new views of the universe
 - d. Economic life: the course of industrialization (1870–1914)
 - i. Industrial proliferation: expansion into new areas such as the U.S., eastern Europe, and Japan
 - ii. Changing balance of economic power in Europe: emergence of Germany as the leading industrial power, decline of British industrial strength
 - iii. The revolution in transportation and communications: steam navigation and the beginning of air travel; the internal-combustion engine; the telegraph, telephone, and radio; industrialization on the eve of World War I

2. International war and diplomacy from 1850 to c. 1920: *Realpolitik* and European diplomatic realignments
 - a. The era of Italian and German unification
 - i. Final dissolution of the Congress of Vienna alliance system: the Crimean War (1853–56) and its aftermath
 - ii. The Italian War of Independence: French intervention against Austria in Italy, the establishment of the Kingdom of Italy (1861)
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 - i. Bismarck's system of alliances: the Dreikaiserbund and the isolation of France, the Russo-Turkish War (1877–78) and the Congress of Berlin (1878–79), the Triple Alliance (1882)
 - ii. The Franco-Russian alliance (from 1893) and the Entente Cordiale (1904): Russia's defeat in the Far East (1904–05) and the formation of the Triple Entente (1907)
 - iii. Prelude to World War I: the Moroccan and Bosnian crises, the Balkan Wars (1912–13), the outbreak of war between the great powers (1914)
 - c. The resurgence of European imperialism (c. 1875–1914)
 - i. Renewed interest in overseas expansion by the European powers in the late 19th century: new acquisitions and new colonial powers, development of new theories of imperialism
 - ii. The European penetration of Asia and the partitioning of Africa: Russian expansion, economic penetration of China, rise of Japan, scramble for Africa
 - d. World War I (1914–18) and the Treaty of Versailles (1919)
 - i. The Serbian crisis and general mobilization: the opening German offensive in the east and west (August 1914), stabilization of the Western Front, trench warfare, new military technology (air power, tanks, and poison gas), the Battle of Verdun, renewed stalemate
 - ii. The entrance of Italy, Turkey, Japan, and other nations into the war: campaigns in the Balkans and the Middle East
 - iii. German submarine warfare and the U.S. entry into the war (1917); the Russian Revolution (1917), military collapse, and the Treaty of Brest-Litovsk (1918); the last Allied offensive and the armistice (1918)
 - iv. Total war and the mobilization of whole populations; the dissolution of the Austro-Hungarian, Russian, and Ottoman empires
 - v. The leadership, industrial strength, strategic plans and goals, and tactical and logistical procedures of the belligerents
 - vi. The Paris Peace Conference (1919–20) and the peace treaty: Wilson's influence; German reparations, restrictions, and territorial losses; reorganization of central Europe and the Middle East by the Allies; the mandates and the League of Nations
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 - a. Great Britain and Ireland and expansion of overseas empire (1850–1920)
 - i. Mid-Victorian politics and economics: liberalism and free trade, the Great Exhibition (1851), Russell's and Palmerston's foreign policies regarding the Crimean War and the Indian Mutiny, Second Reform Bill (1867)
 - ii. Mid-Victorian society and religion: Victorian social attitudes (duty, thrift, hard work, and character), liberalism and the High Church movement, revival of Scottish Calvinism
 - iii. Gladstone's liberalism and "Tory Democracy" and imperialism under Disraeli; Third Reform Bill (1884); the Irish Question and the rise of Fenianism, Parnell, and the Home Rule movement; Chamberlain and the split in the Liberal Party; Fabian socialism and growth of the Labour movement; South African War (1899–1902)
 - iv. The return of the Liberals (1905–14): Lloyd George's people's budget and National Insurance Act (1911), Parliament Act of 1911, continuing struggle over Ireland and Unionism in Ulster

- v. British participation in World War I: Lloyd George's Coalition government, the Easter Rising of 1916 in Ireland
- b. France from 1852 to 1920: the Second Empire and the Third Republic
 - i. Napoleon III's authoritarian policies and reassertion of France's role in Europe (the Crimea and Italy); partnership with Britain (1852–60), the liberal years (1859–70), foreign policy failures and defeat by Germany (1871)
 - ii. The siege of Paris, the Commune, and the establishment of the Third Republic (1870); attempts at restoration; the "Republican Republic"; opportunist control under Gambetta; the Boulangists; colonial expansion; the Dreyfus affair; separation of church and state (1905)
 - iii. The prewar years: conflicts between French rightists and Socialists, alignment with Russia and Britain before World War I, nationalism and revanchism
 - iv. World War I (1914–18): German occupation of northeastern France, the crisis of 1917, the Clemenceau government, French human and material losses in the war
- c. The unification of Germany and Prussia (1850–1920)
 - i. William I and tentative reform: clashes with the liberals, Bismarck and reform of the Prussian Army, parliamentary subservience to the crown
 - ii. Prussian and Austrian differences over the subjugation of Schleswig-Holstein (1864–66), the exclusion of Austria and the union of north and south Germany in the German Empire after the defeat of France (1871)
 - iii. Bismarck as imperial chancellor (1871–90): *Kulturkampf* and the breach with the National Liberals, anti-Socialist measures and social legislation, Bismarck's consolidation of German power and formation of the Triple Alliance (1882)
 - iv. The accession of Emperor William II (1888) and the fall of Bismarck; chancellorships of Caprivi, Hohenlohe, and Bülow (1890–1909); estrangement from Russia and rivalry with Britain; colonial expansion; militarists and Social Democrats in the period before World War I
 - v. World War I (1914–18) and increasing influence of the army: German military defeat (1918), establishment of the German Republic (1919)
- d. The Austrian and Austro-Hungarian Empire from 1850 to 1920
 - i. Constitutional experiments: the Kremsier and Stadion constitutions; the "Bach System," the October Diploma (1860), and the February Patent (1861); federalism and centralism (1850–67); the role of Emperor Francis Joseph (1848–1916); exclusion from Italy (1859) and Germany (1866); the *Ausgleich* (Compromise) and the establishment of the Dual Monarchy (1867)
 - ii. Austria: the liberal ascendancy under the Auersperg ministry (1871–78) and the coalition of clericals, German aristocrats, and Slavs under Taaffe (1879–93); relations between Austrians and Slavic minorities in the empire; the introduction of universal male suffrage (1907); foreign policy (1878–1908); annexation of Bosnia and Herzegovina and the crises in the Balkans
 - iii. Hungary: the Andrassy government, internal conflict between the opponents and advocates of the Compromise of 1867, social reforms and economic progress, Magyar supremacy maintained under Tisza (1875–90)
 - iv. Adherence to the Triple Alliance, increasing governmental paralysis and subordination to Germany during World War I, the dissolution of the Habsburg monarchy (1918) and the dismemberment of the empire
- e. The Russian Empire from c. 1850 to 1917
 - i. Defeat in the Crimean War (1853–56), abolition of serfdom (1861) and local government reforms under Alexander II (1855–81), Polish rebellion of 1863 and the spread of revolutionary sentiment, the assassination of the Tsar (1881)
 - ii. Reversal of the reform movement under Alexander III (1881–94), the *zemstvos*, government hostility to non-Russian minorities, Nicholas II (1894–1917), anti-reform policies, foundation of the Social Democrats and Social Revolutionaries
 - iii. Economic, cultural, and social developments: Russification policies, foreign policies
 - iv. Disorders following defeat in the Russo-Japanese War (1904–05), the Dumas, World War I and the abolition of the monarchy (1917)
- f. Italy from 1850 to 1920

- i. Cavour and the unification of Italy under Victor Emmanuel of Piedmont: alliance with France and domestic liberalism, papal opposition, Austrian defeat and territorial cessions in northern Italy in the war of 1859, Garibaldi and the conquest of the south, the annexation of Venetia from Austria (1866) and acquisition of Rome (1870)
 - ii. The Kingdom of Italy: Minghetti, Depretis, and Crispi; Italian adherence to the Triple Alliance; growth of Socialism, labour movements, and militant nationalism; the Giolitti era; participation in World War I
- g. Switzerland from 1850 to 1920: domestic policies, neutrality in World War I
- h. Spain and Portugal
 - i. Continued civil strife in Spain: control by the military; Carlists, *moderados*, *progressistas*, and republicans; the First Republic (1873–74); constitutional monarchy in 1876; further colonial losses in the Spanish-American War (1898)
 - ii. The reaction against liberalism following Spain's defeat, Spanish involvement in Morocco, civil tensions and neutrality in World War I
 - iii. Alternating progressive and conservative governments in Portugal under Pedro V (1853–61) and Luís I (1861–89), dispute with Great Britain over colonial policies, financial difficulties, dictatorship in 1906, the Portuguese Republic (1910) and Portugal's adherence to the British alliance in World War I
- i. Scandinavia from 1850 to 1920
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 - ii. Sweden–Norway: parliamentary reforms in Sweden under Charles XV (1859–72), foreign policy, attitudes in Sweden and in Norway toward the Swedish–Norwegian union
 - iii. Finland and Iceland: the language problem and political reforms in Finland, its relations with Russia, Iceland's demands for self-government
- j. The Low Countries from 1848 to 1920
 - i. The Netherlands: liberalization after 1848, the establishment of the independence of Luxembourg (1890), Queen Wilhelmina and World War I
 - ii. Belgian Liberal government (1857–84), rise of Catholic and Belgian Workers' (Socialist) parties, the education controversy and Catholic party rule (1884–1914), universal male suffrage and child labour laws, Leopold II's establishment of Congo Free State (1885) and annexation as Belgian Congo (1908), Flemish resistance to the French-speaking elite
 - iii. World War I: Dutch neutrality and the German conquest of Belgium
- k. The Balkan States from 1850 to 1920: power conflicts resulting in the Balkan Wars (1912–13) and World War I
 - i. Greece: the overthrow of Otho I (1862), the constitution of 1864, acquisition of the Ionian Islands (1864) and Thessaly (1881), Cretan union with Greece (1908), Venizélos' policies, eventual adherence to the Triple Entente in World War I
 - ii. Serbia: restoration of Miloš Obrenović in 1858, defeat by Turkey (1876), the Kingdom of Serbia (1882), the pro-Austrian policy of the Obrenović dynasty, restoration of the Karageorgević dynasty and pro-Russian orientation, conflict with Austria-Hungary, conquest by the Central Powers in World War I
 - iii. Bulgaria: "great Bulgaria" established by the Treaty of San Stefano (1878), Prince Alexander I and Russian influence (1879–86), Ferdinand I (1887–1918) and Stambolov's formation of a government, revolt of the Macedonian minority (1903), separation from Turkey (1908), adherence to the Central Powers in World War I
 - iv. Romania: union of Moldavia and Walachia under Alexandru Cuza (1861), Carol I (1866–1914; king after 1881), independence from Turkey (1878), alignment with the Triple Entente and conquest by the Central Powers in World War I

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Count
Beneš, Edvard
Berchtold,
Leopold,
Count von
Beust, Friedrich
Ferdinand,
Graf von
Charles, Archduke
Cobenzl, Ludwig,
Graf von
Conrad von
Hötzendorf,
Franz, Graf
Deák, Ferenc
Francis II
(Germany/Holy
Roman Empire)
Francis Ferdinand,
Archduke of
Austria-Este
Francis Joseph
Gentz, Friedrich
Habsburg,
House of
Károlyi, Mihály,
Count
Kaunitz, Wenzel
Anton von
Kossuth, Lajos
Kun, Béla
Leopold II
(Germany/Holy
Roman Empire)
Metternich,
Klemens,
Fürst von
Radetzky, Joseph,
Count
Rudolf, Archduke
and Crown
Prince of Austria
Schwarzenberg,
Felix, Prince zu
Schwarzenberg,
Karl Philipp,
Prince zu
Stadion, Johann
Philipp, Graf von

Balkans:

Carol I
Dhiliyiánnis,
Theódoros
Ferdinand
(Bulgaria)
Ferdinand I
(Romania)
Garašanin, Ilija
Kapodístrias,
Ioánnis Antónios,
Count
Karageorge
Mavrokordátos,
Aléxandros
Milan IV (or II)
Miloš
Nicholas I
(Montenegro)
Otto (Greece)
Pašić, Nikola
Peter I
(Montenegro)
Peter I (Serbia)
Stamboliyski,
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Venizélos,
Eleuthérios

Britain and Ireland:

Aberdeen, George
Hamilton-Gordon,
4th Earl of
Albert, Prince
Consort of Great
Britain and
Ireland
Asquith, H.H.
Balfour, Arthur
James Balfour,
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Bentinck, Lord
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Vaux, Henry
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Campbell-Bannerman,
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Cobden, Richard
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Collingwood,
Cuthbert
Collingwood, 1st
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Collins, Michael
Cornwallis, Charles
Cornwallis, 1st
Marquess and
2nd Earl
Cromer, Evelyn
Baring, 1st Earl of
Curzon, George
Nathaniel
Curzon,
Marquess
Dalhousie,
James Andrew
Broun Ramsay,
Marquess and
10th Earl of
Derby, Edward
Stanley, 14th
earl of

Devonshire,
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Cavendish, 8th
Duke of
Dillon, John
Disraeli, Benjamin
Dundonald,
Thomas
Cochrane, 10th
Earl of
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Fisher, John
Arbuthnot Fisher,
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Forster, William
Edward
Fox, Charles James
French, John
George III
George IV
George V
Gladstone,
William Ewart
Goldie, Sir George
Grenville, William
Wyndham
Grenville, Baron
Grey, Charles
Grey, 2nd Earl
Grey, Sir Edward,
3rd Baronet
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Haig, Douglas
Haig, 1st Earl
Haldane, Richard
Burdon
Hardie, J. Keir
Howe, Richard
Howe, Earl
Hyndman, Henry
Mayers
Jellicoe, John
Rushworth
Jellicoe, 1st Earl
Kitchener, Horatio
Herbert
Kitchener,
1st Earl
Lansdowne, Henry
Charles Keith
Petty-Fitzmaurice,
5th marquess of

Lawrence, John
 Laird Mair
 Lawrence, 1st
 Baron
 Lawrence, T.E.
 Liverpool, Robert
 Banks Jenkinson,
 2nd Earl of
 Livingstone, David
 Lloyd George,
 David
 Lugard, F.D.
 Macaulay, Thomas
 Babington
 Macaulay, Baron
 Melbourne,
 William Lamb,
 2nd Viscount
 Napier, Robert
 Napier, 1st
 Baron
 Nelson, Horatio
 Nelson, Viscount
 Northcote, Sir
 Stafford Henry,
 8th Baronet
 O'Connell, Daniel
 Palmerston, Henry
 John Temple, 3rd
 Viscount
 Parnell, Charles
 Stewart
 Pearce, Patrick
 Henry
 Peel, Sir Robert
 Perceval, Spencer
 Pitt, William, the
 Younger
 Portland, William
 Henry Cavendish
 Bentinck, 3rd
 Duke of
 Raglan, FitzRoy
 James Henry
 Somerset, 1st
 Baron
 Redmond, John
 Ripon, George
 Frederick Samuel
 Robinson, 1st
 Marquess of
 Rosebery,
 Archibald Philip
 Primrose, 5th
 earl of
 Russell, John
 Russell, 1st Earl
 Salisbury, Robert
 Arthur Talbot
 Gascoyne-
 Cecil, 3rd
 marquess of

Shaftesbury,
 Anthony Ashley
 Cooper, 7th
 Earl of
 Sidmouth, Henry
 Addington, 1st
 Viscount
 Stanley, Sir Henry
 Morton
 Tone, Wolfe
 Victoria
 Wellesley, Richard
 Colley Wellesley,
 Marquess
 Wellington, Arthur
 Wellesley, 1st
 Duke of
 Wilberforce,
 William
 William IV
 Wilson, Sir Henry
 Hughes, Baronet
 Wolseley, Garnet
 Joseph Wolseley,
 1st Viscount

France:

Babeuf,
 François-Noël
 Barras,
 Paul-François-
 Jean-Nicolas,
 vicomte de
 Berthier,
 Louis-Alexandre
 Blanc, Louis
 Bonaparte, Jérôme
 Bonaparte, Joseph
 Bonaparte, Lucien
 Boulanger, Georges
 Bourbon, House of
 Briand, Aristide
 Brissot,
 Jacques-Pierre
 Broglie, Victor, 3^e
 duc de
 Broglie, Albert, 4^e
 duc de
 Caillaux, Joseph
 Cambacérès,
 Jean-Jacques-
 Régis de
 Cambon, Joseph
 Carnot, Lazare
 Caulaincourt,
 Armand,
 marquis de
 Charles X
 Clemenceau,
 Georges
 Couthon, Georges
 Danton, Georges

Decazes, Élie,
 Duke
 Delcassé,
 Théophile
 Desmoulins,
 Camille
 Dreyfus, Alfred
 Dumouriez,
 Charles-François
 du Périer
 Enfantin,
 Barthélemy-Prospér
 Foch, Ferdinand
 Fouché, Joseph
 Gambetta, Léon
 Guizot, François
 Hébert,
 Jacques-René
 Hoche, Lazare
 Jaurès, Jean
 Joffre,
 Joseph-Jacques-
 Césaire
 Joséphine
 Lafayette,
 Marie-Joseph-
 Paul-Yves-
 Roch-Gilbert
 du Motier,
 marquis de
 Lamartine,
 Alphonse de
 Ledru-Rollin,
 Alexandre-Auguste
 Lesseps,
 Ferdinand,
 Viscount de
 Loubet, Émile
 Louis XVI
 Louis XVIII
 Louis-Philippe
 Lyautey,
 Louis-Hubert-
 Gonzalve
 Mac-Mahon,
 Marie-Edme-
 Patrice-Maurice,
 comte de
 Macdonald,
 Jacques-Alexandre
 Marat, Jean-Paul
 Marie-Antoinette
 Marie-Louise
 Masséna, André
 Mirabeau,
 Honoré-Gabriel
 Riqueti, comte de
 Moreau, Victor
 Napoleon I
 Napoleon III
 Necker, Jacques

Nemours,
 Louis-Charles-
 Philippe-Raphaël
 d'Orléans,
 Duke de
 Ney, Michel
 Ollivier, Émile
 Orléans,
 Louis-Philippe-Joseph,
 duc d'
 Pichegru, Charles
 Poincaré,
 Raymond
 Pozzo di Borgo,
 Charles-André,
 Count
 Robespierre,
 Maximilien-François-
 Marie-Isidore de
 Roland,
 Jean-Marie
 Roland,
 Jeanne-Marie
 Saint-Just,
 Louis de
 Sieyès,
 Emmanuel-Joseph
 Talleyrand,
 Charles-
 Maurice de
 Thiers, Adolphe
 Villèle, Joseph,
 comte de
 Viviani, René
 Waldeck-Rousseau,
 René

Germany:

Bennigsen,
 Rudolf von
 Bethmann
 Hollweg,
 Theobald von
 Bismarck,
 Otto von
 Blücher, Gebhard
 Leberecht von
 Bülow, Bernhard,
 Fürst von
 Caprivi, Leo,
 Graf von
 Dahlmann,
 Friedrich
 Ebert, Friedrich
 Engels, Friedrich
 Erzberger,
 Matthias
 Frederick
 Augustus I
 Frederick
 Augustus II
 Frederick
 William II

Frederick William III	D'Annunzio, Gabriele	Arakcheyev, Aleksey	Rostopchin, Fyodor
Frederick William IV	Depretis, Agostino	Andreyevich, Graf	Vasilyevich, Graf
Gneisenau, August, Count	Farini, Luigi Carlo	Bennigsen, Leonty	Savinkov, Boris
Neidhardt von	Ferdinand I	Leontyevich,	Viktorovich
Hardenberg, Karl	(Naples)	Graf von	Shāmil
August, Fürst von	Ferdinand II	Catherine II	Skobelev, Mikhail
Hindenburg,	(Naples)	Chernyayev,	Dmitriyevich
Paul von	Francis I (Naples)	Mikhayl	Speransky, Mikhail
Hohenlohe-	Francis II (Naples)	Grigoryevich	Mikhaylovich,
Schillingsfürst,	Garibaldi,	Gorchakov,	Graf
Chlodwig Karl	Giuseppe	Mikhail	Stolypin, Pyotr
Viktor, Fürst zu	Gioberti,	Dmitriyevich,	Arkadyevich
Hohenzollern	Vincenzo	Prince	Witte, Sergey
dynasty	Giolitti, Giovanni	Guchkov,	Yulyevich, Graf
Holstein,	Mazzini, Giuseppe	Aleksandr	<i>Scandinavia:</i>
Friedrich von	Murat, Joachim	Ivanovich	Branting, Karl
Kiderlen-Wächter,	Orlando, Vittorio	Ignatyev, Nikolay	Hjalmar
Alfred von	Emanuele	Pavlovich, Graf	Charles XIII
Louis I (Bavaria)	Pelloux, Luigi	Kerensky,	(Sweden)
Louis II (Bavaria)	Savoy, House of	Aleksandr	Charles XV
Ludendorff, Erich	Umberto I	Fyodorovich	(Sweden)
Marx, Karl	Victor	Kornilov, Lavr	Christian VIII
Maximilian I	Emmanuel I	Georgiyevich	Christian IX
(Bavaria)	Victor	Kutuzov, Mikhail	Christian X
Maximilian II	Emmanuel II	Illarionovich,	Frederick VI
(Bavaria)	Victor	Prince	(Denmark)
Moltke,	Emmanuel III	Lenin, Vladimir	Frederick VII
Helmuth von	Visconti-Venosta,	Ilich	(Denmark)
Radowitz, Joseph	Emilio, Marchese	Lobanov-Rostovsky,	Frederick VIII
Maria von	<i>Low Countries:</i>	Aleksey	(Denmark)
Roon, Albrecht	Albert (Belgium)	Borisovich,	Gustav IV Adolf
Theodor Emil,	Bonaparte, Louis	Knyaz	Gustav V
Graf von	Leopold I	Lvov, Georgy	Haakon VII
Scharnhorst,	(Belgium)	Yevgenyevich,	Oscar I
Gerhard Johann	Leopold II	Prince	Oscar II
David von	(Belgium)	Milyukov, Pavel	<i>Spain:</i>
Schlieffen, Alfred,	William I	Nikolayevich	Alfonso XII
Graf von	(Netherlands:	Milyutin, Dmitry	Alfonso XIII
Stein, Karl,	king)	Alekseyevich,	Bonaparte, Joseph
Reichsfreiherr	William II	Count	Cánovas del
vom und zum	(Netherlands:	Nesselrode, Karl	Castillo, Antonio
Tirpitz, Alfred von	king)	Vasilyevich,	Carlos Luís de
William I	William III	Count	Borbón
(German Empire)	(Netherlands:	Nicholas I	Carlos María de
William II	king)	Nicholas II	los Dolores de
(German Empire)	<i>Portugal:</i>	Orlov, Aleksey	Borbón
<i>Italy:</i>	Beresford, William	Fyodorovich,	Carlos María
Bandiera, Attilio;	Carr Beresford,	Knyaz	Isidro de Borbón
and Bandiera,	Viscount	Paskevich, Ivan	Castelar y Ripoll,
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Cavour, Camillo	Michael	Valentinovich	Isabella II
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Charles Albert	<i>Russia:</i>	Konstantin	María Cristina II
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Crispi, Francesco	Alexander III	Yefimovich	Francisco
	Alexandra		

Section 964. European Colonies in the Americas from 1492 to c. 1790

- A. The geography and ethnography of the Americas
- B. Spanish and Portuguese colonies in the Americas, other European powers in South America and the Caribbean to c. 1790
 1. Spanish discovery, exploration, and conquest of the Caribbean islands, Mexico, Central America, Peru, Venezuela, Colombia, and Río de la Plata (1492–c. 1550)
 2. Spain's colonial empire
 - a. Colonial administration: the Council of the Indies, viceroys and other provincial officials, *audiencias*, legal restrictions on public officials
 - b. Indian policy: slavery and peonage under the *encomienda* and *repartimiento*, the missionary role of the Roman Catholic Church, decline of the Indian population, introduction of black slaves
 - c. Colonial economy: expansion of agriculture; gold and silver mining; cattle industry; mercantilism, smuggling, and piracy
 3. The exploration and colonization of Brazil by the Portuguese (from 1500)
 - a. Colonial economic policies: introduction of black slavery, gold and diamond mining, agricultural and commercial development
 - b. Colonial administration: establishment of captaincies (1533), centralized royal control (1549), role of the Roman Catholic Church, the Brazilian racial mixture
 4. Administrative reforms of the Spanish Bourbon kings (1700–88): decentralization of the governments of Peru, Venezuela, and Chile; encouragement of trade and agriculture
 5. Spanish colonial expansion into North America (c. 1600–1790): settlements and religious missions
 6. English, French, and Dutch territorial and economic expansion (from c. 1600) into areas of Spanish and Portuguese colonization in Latin America and the Caribbean
- C. Norse, English, Dutch, and Swedish discoveries, explorations, and settlements in North America (c. 1000–1763)
 1. Norse voyages to Greenland and North America (c. 1000)
 2. Early English exploration and attempted settlement (1497–c. 1600), Dutch and Swedish settlement and later expulsion by the English
 3. Development of the English colonies in North America
 - a. The founding of the 13 Colonies: economic, political, and religious reasons for settlement
 - b. Economic, political, and social development
 - i. British economic policies: mercantilism and the Navigation Acts
 - ii. Colonial administration: loose royal control prior to 1763, self-government and local political activity
 - iii. Social mobility and the rise of economic classes: immigration and the introduction of slavery, agricultural and commercial development
 - c. Colonial cultural and scientific achievements; *e.g.*, the American Philosophical Society, newspapers and almanacs, the beginning of public education, the “Great Awakening”
 - d. Conflicts with the French and Indians and expulsion of French power from North America (1763)
- D. French discoveries, explorations, and settlements in North America: New France and Louisiana (1524–1763)
 1. The settlement of New France: missionaries, Indian relations, and the fur trade; royal administration and joint-stock companies
 2. Expansion and eventual conflict with the English, resulting in the eclipse of French power in North America (1763)

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and a biography dealing with European colonies in the Americas from 1492 to c. 1790

Arctic, The	Latin America,	New Orleans	South America
Boston	The History of	New York City	United States of
Canada	Mexico	North America	America
Columbus	Montreal	Philadelphia	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>English and French colonization of North America:</i>	Mayflower	1763,	Indies,
Acadia	Compact	Proclamation of	Laws of the
Albany Congress	Mississippi Bubble	Sovereign Council	mameluco
Culpeper's	Molasses Act	Sugar Act	New Granada,
Rebellion	Monongahela,	Walking Purchase	Viceroyalty of
French and	Battle of the	Yamasee War	New Spain,
Indian War	New England,	<i>Spanish and</i>	Viceroyalty of
French Shore	Council for	<i>Portuguese</i>	Palmares
Hat Act	New England	<i>colonization of the</i>	Peru,
Hudson's Bay	Confederation	<i>Americas:</i>	Viceroyalty of
Company	New France	alcalde	Pueblo Rebellion
Iron Act	New Hampshire	asiento de negros	Real Cuerpo de
Iroquois	Grants	audiencia	Minería
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Jamestown	controversy	cabildo	repartimiento
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King William's	Pilgrim Fathers	Golden Cities of	Viceroyalty of the
War	Plymouth	conquistador	Santo Domingo
London Company	Company	Contratación,	Spanish treasure
Lost Colony	Powhatan War	Casa de	fleet
Massachusetts Bay	proprietary colony	corregidor	Strangford Treaty
Colony	Quebec, Battle of	donatário	<i>other:</i>
Mayflower	Queen	Eldorado	Middle Passage
	Anne's War	encomienda	New Sweden
	Salem witch trials	fazenda	Vinland

Biographies

<i>English explorers and colonizers:</i>	<i>French explorers and colonizers:</i>	Laval, François de	Díaz de Solís,
Cabot, John	Bienville,	Montmorency	Juan
Cabot, Sebastian	Jean-Baptiste	Roberval,	Las Casas,
Cook, James	Le Moyne de	Jean-François de	Bartolomé de
Hudson, Henry	Cartier, Jacques	La Rocque,	Narváez,
Johnson, Sir	Champlain,	Sieur de	Panfilo de
William, 1st	Samuel de	<i>Spanish and</i>	Soto,
Baronet	Frontenac, Louis	<i>Portuguese explorers</i>	Hernando de
Mather, Cotton	de Buade, comte	<i>and colonizers:</i>	Velázquez, Diego
Mather, Increase	de Palluau et de	Balboa, Vasco	Vespucci,
Penn, William	Iberville, Pierre Le	Núñez de	Amerigo
Pocahontas	Moyne d'	Cabral, Pedro	<i>other:</i>
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Stirling, William	René-Robert	Columbus,	Chirikov, Aleksey
Alexander, 1st	Cavalier, Sieur de	Christopher	Ilich
earl of	La Vérendrye,	Coronado,	John Maurice of
Williams, Roger	Pierre Gaultier de	Francisco	Nassau
Winthrop, John	Varennnes, et de	Vázquez de	

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- A. The United States to 1865: national formation and territorial expansion, conflict between North and South
 1. Establishment and consolidation of the United States (1763–1816)
 - a. The American Revolutionary period (1763–87)
 - i. Political and economic opposition to Britain's taxation policies culminating in the Declaration of Independence (1776)
 - ii. The U.S. War of Independence (1775–83): land and sea campaigns, military leadership, French military support, peace treaty (1783)
 - iii. The government of the Articles of Confederation (1781–87) and evolution of a western lands policy
 - b. The strengthening of the national government (1787–1816)
 - i. The Constitutional Convention, the federal Constitution, and the struggle for ratification (1787–89)
 - ii. Development of national policies and formation of political parties: Hamilton's economic policies, foreign relations during the administrations of Washington and John Adams, Federalists and Democratic-Republicans
 - iii. Jefferson's administration and the Louisiana Purchase (1803), Madison's administration and the War of 1812, role of the Supreme Court
 2. The United States from 1816 to 1850: nationalism, expansionism, extension of the franchise, and industrialization
 - a. Strengthening of national feelings: administrations of Monroe and John Quincy Adams, Supreme Court under Marshall
 - i. "The Era of Good Feelings" (1816–24): nationalism and sectionalism, the Missouri Compromise (1820)
 - ii. Developments in commerce and finance: industrialization and early labour movements, transportation and internal improvements, cotton and slavery
 - iii. Social development: German and Irish immigration (1830–50), urbanization and social mobility
 - b. Jacksonian democracy (1829–41): extension of the franchise; development of Democratic, Whig, and minor party politics; bank war; nullification; Indian removal policy
 - c. The "Age of Reform" (1830–50): the Abolitionist movement and other reform activities, diverse religious attitudes
 - d. Westward expansionism: annexation of Texas, acquisition of Oregon, the Mexican War (1846–48) and the annexation of California and New Mexico, the Compromise of 1850
 - e. Cultural development to 1850: the growth of the novel, poetry, music, the visual arts, historical writings, the Transcendentalist movement
 3. The United States from 1850 to 1865: sectionalism, secession, and Civil War
 - a. Sectionalism and slavery: economic and psychological bases of slavery, the failure of popular sovereignty, the Abolitionist movement, literature of the period
 - b. Political and geographical polarization: disruption of the Democratic and Whig parties, emergence of the Republican Party, and Lincoln's election (1860)
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 - i. Relative military strengths: strategies and tactics of North and South
 - ii. The land and sea war (1861–65): initial Confederate victories, Union success in the West and final victory over the South
 - iii. Foreign affairs of the Union and the Confederacy, moves toward emancipation during the war
- B. The United States from 1865 to 1920: Reconstruction, industrialization, increased immigration, development of the West, and emergence as a world power
 1. Radical Reconstruction (1866–77) and the New South (1877–1900)

- a. Lincoln's plan for Reconstruction and congressional opposition (1864–65), conflicts between the Radical Republican-controlled Congress and Andrew Johnson, state "Black Codes" and federal civil rights legislation
 - b. Reconstruction (1866–77): freedmen, sharecropping, and "Black Reconstruction"; Grant's administrations and the decline of Republican control in the South
 - c. The New South (1877–1900): conservative Democrats in control and erosion of black rights, Populist resurgence in the 1890s, white supremacy and Jim Crow legislation, the black response
2. The transformation of American society: the United States from 1865 to 1900
 - a. Urbanization and immigration: southern and eastern European immigrants and growth of slums, problems of prejudice, rise of city machine politics, development of public education
 - b. The development of the West (1865–1900)
 - i. The quest for gold and silver: boom and bust in mining towns
 - ii. Cattlemen and the open range: the cattle industry (1866–88), the cowboy and cattle drives, conflicts with settlers
 - iii. Westward expansion of the railroads: early government subsidies, relationship of the transcontinental carriers to the national economy
 - iv. Violation of the Indian treaties: settlers' encroachments on Indian lands, Indian wars, corruption among agents of the Bureau of Indian Affairs
 - c. The industrialization of the American economy: the manufacturing boom
 - i. Technological advances in the iron and steel industry; exploitation of oil, ores, lumber, and other natural resources
 - ii. Development of trusts and holding companies: development of a legal climate favourable to big business
 - d. U.S. foreign trade and commerce: growth of exports and imports
 - e. Emergence of national labour union organizations: strikes and boycotts, collective bargaining, antilabour stance of government, the Haymarket Riot (1886)
 - f. National politics (1877–1900): general ascendancy of Congress and decline of the presidency
 - i. Aftermath of the disputed election of 1876: the Compromise of 1877, the end of Southern Reconstruction, and Hayes's administration (1877–81); inflation and the silver issue
 - ii. The election of 1880 and the presidency of Garfield: Garfield's assassination (1881), Arthur's administration (1881–85), establishment of the Civil Service Commission (1883)
 - iii. The election of 1884 and Cleveland's first administration (1885–89): the reemergence of presidential leadership, the Treasury surplus and tariff issues, the Interstate Commerce Act (1887) and federal regulation of railroads
 - iv. The election of 1888 and Benjamin Harrison's administration (1889–93): congressional leadership, the Sherman Anti-Trust and Sherman Silver Purchase acts, and the McKinley Tariff Act (1890)
 - v. Depressed agricultural conditions (1887–97): the Farmers' Alliances and the establishment of the Populist Party (1891), farmers' defection from Republican Party
 - vi. The election of 1892 and Cleveland's second administration (1893–97): gold reserves and the Panic of 1893, repeal of the Sherman Silver Purchase Act (1893), lowering of the tariff
 - vii. The election of 1896 and McKinley's administration (1897–1901): the raising of the tariff (1897) and the Gold Standard Act (1900), gradual economic recovery
 3. Imperialism, the Progressive Era, and the rise to world power (1896–1920)
 - a. The emergence of the U.S. as an imperial power
 - i. The Spanish–American War and U.S. suzerainty over Cuba; acquisition of the Philippines, the Hawaiian Islands, and Puerto Rico (1898)
 - ii. The "Open Door" policy and armed intervention in China (1900)
 - iii. Acquisition of the Panama Canal Zone (1903) and the Roosevelt Corollary to the Monroe Doctrine: intervention in Haiti, the Dominican Republic, Cuba, and Nicaragua

- b. The Progressive Movement (c. 1896–1920)
 - i. Scholars, social workers, and “muckrakers” as leaders of the Progressive Movement; social and political urban reforms by state government
 - ii. Theodore Roosevelt’s administrations (1901–09) and expansion of presidential power and regulatory legislation, Taft’s administration (1909–13) and the defection of Progressive Republicans in the 1912 election
 - iii. Wilson’s first administration (1913–17): tariff, currency, credit, tax, and labour reforms; intervention in Mexican affairs
- c. The role of the U.S. in World War I
 - i. Initial U.S. neutrality: loans and supplies to the Allies, submarine warfare and the break with Germany
 - ii. U.S. entry into the war: mobilization of manpower and the economy, decisive effect of U.S. military forces on the Western Front (1918)
 - iii. Wilson’s policies at the Paris Peace Conference (1919) and the U.S. Senate rejection of the Treaty of Versailles (1920), the election of 1920 and the return to isolationism
- 4. Cultural developments from 1865 to 1920
 - a. Advances in fiction, poetry, drama, music, and the visual arts
 - b. Developments in education and historical writings, growth of American philosophy
- C. Canada under British colonial rule from 1763 to 1867, the Dominion of Canada from 1867 to 1920
 - 1. British colonial administration: the Quebec Acts of 1763 and 1774, immigration of United Empire Loyalists after U.S. War of Independence, establishment of French- and English-speaking provinces
 - 2. Social, political, and economic development from 1790 to 1850
 - a. Immigration, westward expansion, and the fur trade; participation in the War of 1812
 - b. Dissension between French and English settlers: the rebellions of 1837, the Union of Upper and Lower Canada (1841), self-government for domestic affairs (1848)
 - 3. The Dominion of Canada from 1867 to 1920
 - a. The Confederation movement and the establishment of the Dominion (1867)
 - b. Westward expansion and internal disunity
 - i. Louis Riel and the first Métis-Indian rebellion (1870), establishment of the provinces of Manitoba and British Columbia
 - ii. The transcontinental railroad, suppression of the second Métis-Indian rebellion (1885), economic depression and downfall of the Conservative government (1896)
 - c. Liberal governments under Laurier and economic prosperity (1896–1911)
 - i. The Klondike gold rush (1897) and the settlement of the Northwest Territories, creation of the provinces of Alberta and Saskatchewan (1905)
 - ii. Involvement in Britain’s imperialist policies: participation in South African War (1899), border disputes with the United States
 - d. Economic nationalism and the Conservative government (1911–17): participation in World War I, recognition of Canadian autonomy (1917)

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with the development of the United States and Canada from 1763 to 1920

Boston	Lincoln	Philadelphia	Washington, D.C.
Canada	Montreal	San Francisco	Washington,
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MICROPAEDIA: Selected entries of reference information

General subjects

Canada:

Aroostook War
Assiniboia
Bering Sea Dispute
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Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the development of the Latin-American and Caribbean nations to c. 1920

Argentina	Colombia	Mexico	South America
Bolivia	Ecuador	Mexico City	Suriname
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<i>Central America and the Caribbean:</i>	Chapultepec	<i>South America:</i>	Pacific, War of the
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Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with Australia and Oceania to c. 1920

Australia
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General subjects

<i>Australia:</i>	Immigration	United Australia	New Zealand
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Australian	National Party	ANZAC	<i>other:</i>
Patriotic	New South Wales	Hauhau	Lapita culture
Association	Corps	Maori	Melanesia
Black War	Port Phillip	Representation	Micronesia
blackbirding	Association	Act	Polynesia
bushranger	Port Phillip	New Zealand	
Castle Hill Rising	District	Company	
Emancipist	Rum Rebellion	New Zealand	
Eureka Stockade	squatter	Labour Party	
Exclusive			

Biographies*Australia:*

Arthur, Sir George,
1st Baronet
Barton, Sir
Edmund
Bligh, William
Deakin, Alfred
Forrest, Sir John
Hughes, William
Morris
Macarthur, John
Macquarie,
Lachlan

Parkes, Sir Henry

Phillip, Arthur
Sturt, Charles
Torrens, Sir
Robert Richard
Wentworth, W.C.
New Zealand:
Kingi, Wiremu
Massey, William
Ferguson
Pomare, Sir Maui
Seddon, Richard
John

other:

Bougainville,
Louis-Antoine de
Clunies-Ross
family
Cook, James
Dumont d'Urville,
Jules-Sébastien-César
Flinders, Matthew
Kamehameha I
Kamehameha IV

Mitchell, Sir
Thomas
Livingstone
Oxley, John
Tasman, Abel
Janszoon
Wakefield,
Edward Gibbon
Weld, Sir
Frederick
Aloysius

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1. Portuguese commercial relations with India from 1498: establishment of the colony of Goa, decline of Portuguese hegemony and rise of British and Dutch influence
2. Dutch trading posts and conflicts with the British
3. The British and French in India
 - a. Establishment and growth of British settlements and trading posts (1600–1740): the East India Company, relations with indigenous peoples
 - b. Development of French trading companies from 1674: Anglo-French rivalry (1740–63) and establishment of British hegemony
 - c. The British seizure of Calcutta (1757) and Clive's establishment of British control over the local Bengal ruler (1757–60)

B. Extension of British power (1760–1858)

1. Growth of the political power of the British East India Company and attempts by the British crown to regulate its affairs
 - a. Securing of British supremacy in Bengal
 - b. Warren Hastings (1774–85) and the transition of the status of the company from revenue farmer to a ruling power in India
 - c. Wars with the Marāṭhās and Mysore at the end of the 18th century
 - d. Expansion and consolidation of British control over various Indian states during administrations of Lord Wellesley (1798–1805), Lord Minto (1807–13), and Lord Hastings (1813–23)
 - e. The organization and determination of administrative policy: Cornwallis and the transition toward British administrative procedures
 - f. Completion of British annexation of, or domination over, the Afghan, Sikh, and Lower Burmese kingdoms in the 1840s and 1850s
2. The political, legal, economic, social, and cultural effects of the first century of British influence
3. The cause, outbreak, suppression, and effects of the Indian Mutiny (1857–59): the British crown's assumption of total responsibility for the government of India

C. British imperial power (1858–1920)

1. Climax of the raj: social and economic policies, government organization, the influence of the viceroys
2. British foreign policy in India: conflicts with Russia over the northwest frontier, the incorporation of Burma (1886), the Second Afghan War (1878–80) and the creation of the North-West Frontier Province (1901), the Third Afghan War (1919)

3. Beginning of Indian nationalism in the late 19th century and the British response: formation of the Indian National Congress (1885), policies of Lord Curzon (1899–1905), partition of Bengal, founding of the nationalist Muslim League, the Indian Councils Act of 1909
 4. World War I and its aftermath: India's contribution to the war effort, anti-British activity, the Amritsar massacre, the Government of India Act (1919), Hindu–Muslim relations, the emergence of Mahatma Gandhi and the adoption of his noncooperation policy
- D. Ceylon under foreign rulers from c. 1505 to 1920
1. Portuguese political and commercial activities in Ceylon (1505–1658): conflict with the Kandyan kingdom
 2. Dutch rule in Ceylon (1658–1796) and its influence on the political, economic, judicial, and administrative systems; commercial enterprises and missionary attempts
 3. The British in Ceylon from 1796: unification and early administration, the reforms of 1833, the transition from a subsistence to a commercial economy, the beginnings of constitutional government, nationalist unrest during World War I
- E. Tibet and Nepal from c. 1750 to c. 1920
1. Decline of Chinese influence in Tibet: administration and culture under the Manchus
 2. Nepal's territorial expansion under the Shah rulers, decline of Shah family and rise of Thapa and Rana families, accommodation with the British to preserve Nepal's independence

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with South Asia under the influence of European imperialism from c. 1500 to c. 1920

Asia
Calcutta
India
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MICROPAEDIA: Selected entries of reference information

General subjects

<i>colonial administration and policy:</i>	<i>historic events:</i>	Saint George, Fort	Purandhar, Treaty of
Afridi	Amritsar,	William, Fort	Surji-arjungaon,
Bengal,	Massacre of	<i>nationalist groups and movements:</i>	Treaty of
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Commission	Mutiny	Association	
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Durand Line	Calcutta	Congress	
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zamindar	<i>historic states and sites:</i>	Malvana,	
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Biographies

Britons:

Auckland, George
Eden, earl of
Bentinck, Lord
William
Canning, Charles
John Canning,
Earl
Chelmsford,
Frederic John
Napier Thesiger,
1st Viscount
Clive, Robert, 1st
Baron Clive of
Plassey
Coote, Sir Eyre
Curzon, George
Nathaniel
Curzon,
Marquess
Dalhousie,
James Andrew
Broun Ramsay,
Marquess and
10th earl of
Ellenborough,
Edward Law,
earl of
Elphinstone,
Mountstuart

Fitch, Ralph
Frere, Sir Bartle
Hastings, Francis
Rawdon-Hastings,
1st marquess of
Hastings, Warren
Hume, Allan
Octavian
Lansdowne, Henry
Charles Keith
Petty-Fitzmaurice,
5th marquess of
Lawrence,
Sir Henry
Montgomery
Lawrence, John
Laird Mair
Lawrence, 1st
Baron
Lytton, Robert
Bulwer-Lytton,
1st earl of
Mayo, Richard
Southwell
Bourke, 6th
earl of
Metcalf, Charles T.
Metcalf, Baron

Minto, Gilbert
Elliot-Murray-
Kynynmound, 1st
earl of
Minto,
Gilbert John
Elliot-Murray-
Kynynmound,
4th earl of
Napier, Robert
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Outram, Sir James
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a. Myanmar from c. 1600 to c. 1920

- i. Renewed expansionism and wars with the Mons, Thais, and Chinese under the Alaungpaya dynasty from 1752: the First and Second Anglo-Burmese Wars (1824–26, 1852), traditional administration in Myanmar
- ii. The Third Anglo-Burmese War (1885) and annexation to British India (1886), effects of British colonialism: destruction of traditional church-state relationship, impoverishment of the population

b. Malaya from c. 1630 to c. 1920: loss of autonomy through Dutch and British intrusions

- i. Dutch intervention in the Malay states and seizure of Malacca (1641), immigration of Minangkabau from Sumatra and Buginese from Celebes (mid-17th–18th century)
- ii. British incursions into Malaya in the late 18th century, steady immigration of Chinese throughout the 19th century and resulting social unrest, British intervention and assumption of power from sultanates of Malaya from the 1870s

2. Indochina and the development of French rule from c. 1516

- a. Portuguese and French missionary involvement in Vietnam and Vietnamese reaction (1516–1858), French intervention in Indochina and territorial acquisition of Cochinchina and Cambodia (1858–63)
- b. Period of colonization (1873–93); establishment of French protectorates in Annam, Tonkin, and Laos; French administration in Indochina

3. Siam from c. 1620 to c. 1910
 - a. Trade relations with China and other Asian countries, influence of Theravāda Buddhism, Dutch and French intrusions and establishment of trade in the 1660s
 - b. Invasion by Myanmar (1767) and end of Ayutthayan kingdom domination; political reunification and establishment of Chakkri dynasty (1782); social, cultural, and legal development in the early 19th century; Chinese immigration; expansion of trade with the U.S. and with European countries; reign of Mongkut (1851–68)
 - c. Political, social, and economic reforms in the reign of Chulalongkorn (1868–1910); Anglo-French activity in Southeast Asia and acquisition of Siamese territory (1893–1909)
 4. Laos from c. 1600: establishment of separate kingdoms of Luang Prabang and Vientiane in 1707, Siamese domination from 1778, establishment of French protectorate in 1893
- B. The states and European colonies of the Indonesian Archipelago and the Philippines from c. 1500 to c. 1920
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 - a. Portuguese naval and commercial activities, domination of the Strait of Malacca, and rivalry with the Spanish in the Spice Islands; collapse of Portuguese commercial empire with the defeat by the Dutch (1641)
 - b. The Philippines to c. 1920
 - i. The people and culture of the Philippines prior to the arrival of the Spanish
 - ii. Spanish control of the Philippines (1571–1898): government administration and influence of the Roman Catholic Church, land policy and overseas trade, rise of nationalism in the 19th century
 - iii. The Philippine Revolution of 1896–98, U.S. support in ousting the Spanish, subsequent U.S. takeover and administration to c. 1920
 2. The Dutch and other European powers in Indonesia from c. 1600 to c. 1920
 - a. The Dutch East India Company (1602–1799): Coen's establishment of Dutch commercial supremacy, company rule in Java, decline and abolition of the company
 - b. The French and British in Java (1806–15), Dutch rule in the 19th century
 - i. The Culture System (Cultuur-stelsel) and its deleterious effects on Java (1830–70): the Liberal Policy
 - ii. The Ethical Policy and the rise of nationalism: social and economic benefits, formation of nationalist organizations

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with Southeast Asia under the influence of European Imperialism to c. 1920

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Mataram	Wars		

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<i>Indochina:</i>	Dewantoro, Ki	Bonifacio, Andres	Coen, Jan
Anu, Chao	Hadjar	Burgos, José	Pieterszoon
Chan II	Dipo Negoro,	Mabini, Apolinario	Dewey, George
Chanthakuman	Pangeran	Osmeña Sergio	Dupré, Marie-Jules
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Gia Long	Tjokroaminoto,	Chulalongkorn	Pavie, Auguste
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Le Van Duyet	Wahidin	Rajanubhab	Constantine
Minh Mang	Sudirohusodo,	Devawongse	Phayre, Sir
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Phan Chau Trinh	Bagyidaw	Narai	Poivre, Pierre
Phan Thanh Gian	Bandula, Maha	Phetracha	Raffles,
Siribunyan	Bodawpaya	Rama I	Sir Stamford
Tay Son brothers	Hsinbyushin	Vajiravudh	Rhodes,
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<i>Archipelago:</i>	Nanada Bayin	Bonard,	Rigault de
Agung	Pagan	Louis-Adolphe	Genouilly,
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Hadji Ahmad	<i>Philippine Islands:</i>	Clifford, Sir Hugh	
	Aguinaldo, Emilio	Charles	

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- A. China under the late Ch'ing: the challenges of rebellion and Western penetration
 1. The Western challenge (1839–60) and the collapse of the tributary system: rebellion and the reestablishment of the Ch'ing government
 - a. Problems created by the opium trade: British demands for trade advantages and diplomatic parity culminating in the Opium War (1839–42)
 - i. The Opium War and its aftermath: granting of commercial privileges to Western powers
 - ii. Reactions to foreign trade gains: antiforeign movements concentrated at Canton
 - b. Popular uprisings of the Taiping and Nien and rebellions in western China, the effects of the rebellions
 2. Contending forces of westernization and Chinese tradition from c. 1850
 - a. The “self-strengthening” movement: its effect on foreign relations and on domestic life
 - i. Western attempts at treaty revision and the chilling of Sino-Russian relations, hostility toward Christian missionaries
 - ii. Industrialization for self-strengthening: mining and the weapons industry, malpractice and corruption in business
 - b. Increasing foreign encroachments (1870–95): loss of Central Asian territories, problems resulting from Chinese hesitancy to engage in regular diplomatic relations, Korea and the Sino-Japanese War (1894–95)

- c. The reform movement of K'ang Yu-wei, the conservative reaction, and the Boxer Rebellion (1900) as expressions of anti-foreign feelings: Western seizure of Peking (1900) and further Ch'ing concessions, U.S. Open Door policy
 - d. Reformist and revolutionist movements at the end of the dynasty: Ch'ing reforms after 1901, the Republican movement and the 1911 Revolution
 - i. Sun Yat-sen and the United League: constitutional movements after 1905
 - ii. Peasant uprisings and the 1911 Revolution
- B. The modernization of Japan and its emergence as a world power (1868–c. 1910)
- 1. The Meiji Restoration and the process of modernization
 - a. The fall of the Tokugawa, leadership and initial policies of the new government, samurai opposition and government countermeasures
 - b. Beginning of Japanese modernization: abolition of feudalism; fiscal and economic policies; growth of *zaibatsu* (cartels); development of national loyalties; religious, educational, and cultural policies
 - c. Politics in Meiji Japan: creation of political parties, oligarchic control and gradual development of representative institutions
 - 2. Foreign relations in Imperial Japan: dispute with China over Korea, success in the Russo-Japanese War (1904–05), annexation of Korea (1910), economic expansion in China

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with China from 1839 until the onset of revolution (to c. 1911), and Japan from the Meiji Restoration to c. 1910

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Ch'ing dynasty	Kuldja, Treaty of	<i>Japan—international relations:</i>	Shimonoseki, Treaty of
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Hundred Days of Reform	Opium Wars	Lansing-Ishii Agreement	Railway
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Biographies

<i>China:</i>	Li Hung-chang	Tso Tsung t'ang	Fukuzawa Yukichi
Chang Chih-tung	Liang Ch'i-ch'ao	Tuan Ch'i-jui	Gotō Shōjirō,
Chang Ping-lin	Lin Tse-hsü	T'ung-chih	Hakushaku
Ch'i-ying	Sheng Hsüan-huai	Tz'u-hsi	Inoue Kaoru,
Huang Hsing	Soong family	Yang Hsiu-ch'ing	Kōshaku
Hung Hsiu-ch'üan	Sun Yat-sen	<i>Japan:</i>	Itagaki Taisuke,
K'ang Yu-wei	Sung Chiao-jen	Abe Isoo	Count
Kuang-hsü	Ts'ai Yüan-p'ei	Etō Shimpei	Itō Hirobumi,
Kung Ch'in-wang	Tseng Kuo-fan	Fujita Tōko	Kōshaku

Iwakura Tomomi	Meiji	Yamagata	Ward, Frederick
Katō Hiroyuki,	Ōkubo Toshimichi	Aritomo,	Townsend
Danshaku	Ōkuma Shigenobu,	Kōshaku	Youngblood, Sir
Katsura Tarō	Kōshaku	<i>other:</i>	Francis Edward
Kido Takayoshi	Ozaki Yukio	Fenollosa,	
Kōtoku Shūsui	Saigō Takamori	Ernest F.	
Kuroda Kiyotaka,	Saionji Kimmochi	Hearn, Lafcadio	
Count	Sanjō Sanetomi,	Lay, Horatio	
Maebara Issei	Koshaku	Nelson	
Matsudaira	Shibusawa Eiichi,	Macartney,	
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- A. The Ottoman Empire from 1807 to 1920: European intervention and the continuation of westernization
 1. The empire under Mahmud II: internal reforms and centralization, the Greek revolt (1821–32), the Egyptian revolt (1831–41), Russian intrusions in Turkey
 2. Reaction, revolt, and further disintegration until World War I
 - a. The era of the Tanzimat reforms (1839–76)
 - b. Crisis of 1875–78 and the loss of Romania, Serbia, Montenegro, and most of Bulgaria; the constitution of 1876
 - c. The growth of Turkish nationalism in the reign of Abdülhamid II (1876–1909) and dissolution of the empire, domination by Germany in World War I
- B. Egypt, the Maghrib, and the Arabian Peninsula: the development of Arab nationalism and Zionism
 1. The emergence of modern Egypt (1798–1922)
 - a. Egypt under French (1798–1801) and British (1801–03) occupation, centralized administration of Muḥammad ‘Alī and his successors (1805–82), construction of Suez Canal (1858–69), European financial and military intervention
 - b. Egypt under British rule (1882–1922): reforms by Baring’s (later 1st Earl Cromer) administration (1883–1907), revival of nationalism, World War I and independence (1922)
 2. The Maghrib from 1830 to c. 1930: European penetration into Algeria, Tunisia, Libya, and Morocco
 - a. Algeria from 1830 to 1920: the French conquest (1830–71) and colonial settlements, national resistance movement under Abdelkader, suppression of the Muslim population
 - b. Tunisia from 1830 to c. 1930: French influence to 1881 and status as a French protectorate from 1881
 - c. Morocco from 1830 to 1920: growth of French, Spanish, and British influence and decline of the traditional government; establishment of French and Spanish zones and protectorates (1912)
 - d. Libya (Tripolitania and Cyrenaica) from c. 1834 to 1920: subjection to direct Turkish rule (1835), growth of Italian influence resulting in conquest (1911–12)
 3. Arab nationalism from c. 1850 to 1920, emergence of Zionism as a factor in Middle Eastern affairs
 - a. Origins, growth, and early accomplishments of Arab nationalism; British encouragement in World War I; the postwar settlement
 - b. Origins of the Zionist movement and Jewish immigration to Palestine after 1880, World War I developments and the beginning of conflict between Zionists and Arab nationalists

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1. Iran: the reign of Āghā Moḥammad Khān and the subsequent European penetration of Iran by the British and Russians, overthrow of the Qājār dynasty (1925)
2. Afghanistan: the Bārakzay dynasty, conflicts with the British government of India, British recognition of Afghan independence (1921)

D. Sub-Saharan Africa from c. 1885 to c. 1920

1. The decline in the slave trade; European commercial, missionary, and exploratory activities in the 19th century; the imperialistic scramble for African colonies; the Berlin West Africa Conference (1884–85) and the European partition of Africa
2. The establishment of European colonies in West Africa in the late 19th century
 - a. French, British, and German rivalry: takeover of the Gold Coast, Senegal, Togo, the Cameroons, Dahomey, and the Ivory Coast
 - b. Problems in establishing effective colonial regimes: military problems, control of the territories, reliance on Africans and development of indirect rule
3. Northeast Africa: foreign influences and national movements
 - a. The Mahdist movement in the Sudan (1881–98) and the Anglo-Egyptian Condominium from 1899
 - b. The consolidation of central governmental power in Ethiopia: Tewodros II (1855–68), Yohannes IV (1872–89), and Menilek II (1889–1913); struggles against Egypt, the Sudan, and Italy
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 - a. British explorations under Livingstone and Stanley: attempts to explore the interior
 - b. King Leopold II's colonial enterprise in the Congo: establishment of the Belgian Congo (Congo Free State) and Belgium's Congo policies until World War I
 - c. The French colonies and colonial administration until World War II
6. The scramble for southern Africa, the British–Boer conflict and the establishment of the Union of South Africa (1910), curtailment of economic and political rights of Africans and Asians, the Botha (1910–19) and Smuts (1919–24) governments and National Party opposition under Hertzog

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with Southwest Asia and North Africa (c. 1800–1920), and sub-Saharan Africa (1885–c. 1920) under the influence of European imperialism: the early colonial period

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General subjects

<i>Arabian peninsula:</i>	<i>Egypt and the Nilotic</i>	Wafd	<i>Ottoman Empire:</i>
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Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with international affairs since 1920

European History and Culture	United Nations
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General subjects

<i>between the World Wars:</i>	Kellogg-Briand Pact	Memel dispute	<i>since 1945:</i>
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- C. The arts and intellectual life in Europe since 1920: increasing concern with the problems of alienation and despair, the importance of popular culture

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with Europe since c. 1920

Amsterdam	Edinburgh	Kiev	Rome
Antwerp	European History	Lenin	Russia
Athens	and Culture	Lisbon	Saint Petersburg
Austria	Finland	London	Spain
Balkan States	Florence	Luxembourg	Stalin
Baltic States	France	Madrid	Sweden
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Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and a biography dealing with the United States and Canada since 1920

Arctic, The
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Roosevelt, Franklin D.
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 - c. The Bolivian National Revolution (1952), nationalization of the tin industry, electoral and land reforms, Paz Estenssoro's administrations (1952–56 and 1960–64), U.S. economic aid, civil disorders, alternating military and civilian governments in the 1960s and 1970s, return to civilian rule under Siles Zuazo (1982), foreign debt and other economic problems, effects of drug trafficking, return of Paz Estenssoro as president (1985–89), relative political stability in the late 1980s and early 1990s, civil unrest in the mid-1990s
- E. Chile since 1920
 - 1. Chile from 1920 to 1938
 - a. The presidency of Alessandri Palma (1920–24, 1925), military coup (1924), return to civilian rule (1925), constitution of 1925, political instability, military dictatorship under Ibáñez del Campo (1927–31)
 - b. Economic crises during the 1930s: brief return to civilian rule under Montero Rodríguez, military coup and 100-day rule of Socialist Republic, Alessandri Palma's second administration (1932–38)

2. Chile from 1938 to 1952: the era of the Radical Party presidencies
 - a. The administrations of Cerda (1938–41) and Ríos (1942–46): agrarian reforms, Chilean neutrality until 1942, economic prosperity
 - b. González Videla's administration (1946–52): strengthened economic ties with the U.S., return of Conservative Party influence
 3. Chilean politics since 1952
 - a. Ibáñez del Campo's administration (1952–58) and strong presidential leadership, administration of Alessandri Rodríguez (1958–64), social and economic problems, proliferation of leftist political parties and realignment of conservative parties
 - b. Frei's administration (1964–70) and nationalization of the economy, Allende's Marxist administration (1970–73), military coup (1973) and military rule under Pinochet (1973–90), political repression, continued economic difficulties, presidential election of Aylwin (1990)
- F. Argentina, Uruguay, and Paraguay since c. 1930
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 - a. The conservative restoration (1930–43): economic ties with Great Britain, electoral fraud and violence in the 1930s, neutrality in World War II
 - b. The Perón era (1943–55): his rise to and fall from power, economic policies
 - c. Argentina since 1955: attempts to restore constitutionalism, military dictatorships, civil wars and Peronista resurgence, return (1973) and death (1974) of Perón, military coup (1976), excesses and economic failures of military rule, invasion of the Falkland Islands and defeat by Britain (1982), return to civilian rule under Alfonsín (1983), foreign-debt problems, election (1989) and reelection (1995) of Peronist Carlos Saúl Menem
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 - a. The Great Depression, dictatorship of Gabriel Terra (1933–38), election of Alfredo Baldomir (1938), Uruguayan neutrality in World War II, economic boom and political reforms
 - b. Post-World War II developments: the constitution of 1951 and the plural executive, recession (1954–58), 1958 election of Nationalists (Blancos), return of Colorado Party and return to presidential system (1966), Tupamaro guerrilla insurgency, dismissal of Congress (1973) and assumption of effective control by the military, severe recession of the early 1980s, restoration of civilian government (1985) and amnesty for the military
 3. Paraguay since 1924
 - a. The Great Depression, victory over Bolivia in Chaco War (1932–35), Allied alignment in World War II
 - b. Political instability and economic retardation: Stroessner's dictatorship from 1954 to his overthrow in 1989, democratic reforms and new constitution of 1992
- G. Brazil since 1930: the Second Republic
1. The Getúlio Vargas dictatorship (1930–45): the revolution of 1930, the constitutions of 1934 and 1937, Vargas' consolidation of power (1937), social and economic legislation, Allied participation in World War II, Vargas' forced resignation (1945)
 2. Political, social, and economic developments in Brazil since 1945
 - a. Election of Eurico Gaspar Dutra (1945) and the constitution of 1946, reelection of Vargas (1950), Vargas' forced resignation and suicide (1954), economic development and inflation in the 1950s
 - b. Election of Jânio Quadros as president (1960), Quadros' resignation (1961), parliamentary experiment and figurehead presidency of João Goulart (1961–63), 1963 plebiscite giving Goulart full presidential powers, social and economic unrest and nationalization of oil refineries, revolution and exile of Goulart and the beginning of military rule (1964)
 - c. Presidency of Castelo Branco (1964–67): legislative restrictions on civil liberties and political rights, suspension of existing political parties and creation of artificial two-party system, enhancement of executive power, the constitution of 1967
 - d. Presidencies of Costa e Silva, Médici, Geisel, and Figueiredo after 1967: continued repression amid increasing opposition to military rule, end of artificial two-party system and formation of new parties (1979), gains by opposition parties in 1982 elections, inflation and foreign-debt problems from the early 1980s

- e. Return to civilian rule with presidency of José Sarney (1985–90), liberalized constitution of 1988, presidential election of Collor de Mello (1989), Collor's impeachment and resignation (1992), presidential election of Cardoso (1994)

H. Development of Latin-American literature, music, and visual arts in the 20th century: the intermingling of European, Indian, and African cultures

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with Latin-American and Caribbean nations since c. 1920

Argentina	Colombia	Lima	São Paulo
Bolivia	Ecuador	Mexico	South America
Brazil	Guyana	Mexico City	Suriname
Buenos Aires	Havana	Paraguay	Uruguay
Central America	Latin America,	Peru	Venezuela
Chile	The History of	Rio de Janeiro	West Indies

MICROPAEDIA: Selected entries of reference information

General subjects

<i>Central America and the Caribbean:</i>	Communist Party of Cuba	<i>Mexico:</i>	Estado Novo
Bay of Pigs invasion	Cuban missile crisis	Indigenismo	Falkland Islands War
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Central American Common Market	26th of July Movement	Sinarquism	Rio de Janeiro, Protocol of
	West Indies	<i>South America:</i>	Shining Path
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Biographies

<i>Central America and the Caribbean:</i>	Noriega, Manuel	López Mateos, Adolfo	Menem, Carlos
Arias Sánchez, Oscar	Somoza family	Obregón, Álvaro	Saúl
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 - a. Early power struggles: Chinese involvement in World War I
 - i. Japanese gains in the early part of the war, Yüan Shih-k'ai's attempts to become emperor
 - ii. Conflict over entry into the war, formation of a rival southern government, changes brought about by the war
 - b. Modernization and the growth of nationalism: the new intelligentsia, riots and protests
2. The interwar years (1920–37)
 - a. The beginnings of a national revolution: the Kuomintang, the Chinese Communist Party, cooperation between the two parties

- b. Reactions to warlords and foreigners: militarism in China, the continued presence of foreign interests, reorganization of the Kuomintang
 - c. Struggles within the two-party coalition
 - i. Outbreak of clashes with foreigners, Kuomintang opposition to the radicals
 - ii. The Northern Expedition: peasant uprisings leading to the expulsion of the Communists from the Kuomintang, Communist movement into the hills and plains of central China
 - d. The Nationalist government from 1928 to 1937: Chiang Kai-shek's attempts to eliminate the Communists
 - i. Improvements in infrastructure and education in the cities, decline of the rural economy, economic competition with the Japanese in Manchuria
 - ii. Renewal of Japanese aggression, war between the Communists and Nationalists, the Long March, formation of the United Front against Japan
3. The war against Japan (1937–45)
- a. Communist-Nationalist cooperation in the early stages of the war, renewed conflict between the two groups
 - b. International alliance against Japan: U.S. military aid, internal conflicts, the crisis of 1944 and Nationalist deterioration, Communist growth and international efforts to prevent civil war
4. The development of Kuomintang and Chinese Communist ideologies
- a. Origins and background of modern ideologies: social and political conditions, China's ideological heritage
 - b. The political ideas of Sun Yat-sen: nationalism, democracy, and livelihood
 - c. The political ideas of Chiang Kai-shek: idealization of Chinese tradition
 - d. The development of Maoist ideology: the role of peasants, the "people's war," the border regions
5. Emergence of the People's Republic of China
- a. The Civil War (1945–49): the race for territory, Communist successes and ultimate victory
 - b. Economic reforms and reforms in the traditional Chinese social structure (1949–57)
 - i. Reconstruction and consolidation of power (1949–52): participation in the Korean War, agrarian reform
 - ii. The transition to socialism (1953–57): rural collectivization, urban nationalization
 - c. The period of the Great Leap Forward and the transition to the Cultural Revolution
 - i. New directions in national policy (1958–61): literature and arts for the masses, rural communes
 - ii. Readjustment and reaction (1961–65): restoration of order, China as a nuclear power
 - iii. The Great Proletarian Cultural Revolution (1966–76): attacks on cultural leaders and party members, resistance to Peking
 - iv. Mao's "Reconstruction" (1969–71): the Chinese challenge to Soviet Communism, the Ninth Congress of the Chinese Communist Party (April 1969)
 - d. International relations: UN representation (1971), rapprochement with the U.S. and Japan (1972), friction with the Soviet Union, U.S. diplomatic relations with China (1979), increased cultural and economic contacts overseas, Hong Kong agreement with Great Britain (1984), trade and human-rights disputes with the U.S. in the 1990s
 - e. Internal affairs: factional struggles of the early 1970s, deaths of Zhou Enlai (January 1976) and Mao Zedong (September 1976), ascendancy of Deng Xiaoping and purge of Maoist Gang of Four, new party and national constitutions (1982), changes in economic structure and introduction of economic incentives, forcible repression of pro-democracy movement (1989), social changes resulting from rapid economic growth, death of Deng and restoration of Chinese rule in Hong Kong (1997)
6. The Nationalist government in Taiwan since 1949: initial repression and consolidation; leadership of Chiang Kai-shek until his death; alliance with the U.S. and economic growth; loss of UN representation (1971); Taiwanese separatism; loss of diplomatic support from most nations, including U.S. (1979); end of martial law (1987) and gradual democratization

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1. Japan's political, economic, and social developments in the early 20th century
 - a. Constitutional government: party politics, participation by bureaucrats and business elites
 - b. Social and economic changes: attempts to organize labour, cultural trends, growth of educated classes
2. The rise and fall of Imperial Japan (c. 1920–45)
 - a. The rise of the militarists, growth of antigovernment sentiment, the seizure of initiative in foreign policy by the military, the outbreak of war with China (1937), Axis leanings
 - b. Japan's proclamation of the Greater East Asia Co-prosperity Sphere (1938), official alignment with the Axis Powers (1940), and deterioration of relations with the other Western powers: Tōjō's cabinet and outbreak of war with the U.S. (1941)
 - c. Initial Japanese successes in Southeast Asia and the South Pacific, the Allied counterattack culminating in the fire and atomic bombing of Japanese cities, Japan's unconditional surrender (1945)
 - d. Postwar Japan: political reform, economic and social changes, international relations and cultural developments
 - i. Japan under U.S. military occupation (1945–52): democratization of Japanese society; constitutional, land, and labour reforms; increased rights for women
 - ii. International relations and politics; loss of Korea and other territories, relations with China and the U.S., radical political movements in the 1960s, politics of moderation
 - iii. Restoration of Japanese independence (1952): great economic growth, admission to the UN (1956), return of the Bonins and Ryukyus, Japan as a major world trader, economic tensions with U.S. and the European Community, rapprochement with China (1978), overtures toward Southeast Asia and Korea, long dominance of Liberal-Democratic Party and intra-party factionalism, government-corruption scandals, coalition governments since 1993

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1. Japanese rule (1910–45): military control, the March 1st independence movement and formation of a provisional Korean government in exile (1919), resistance movements and the end of Japanese rule
2. Korea since 1945
 - a. Division into South and North Korea (1948): U.S. and Soviet military aid to and disputes over the two Korean republics
 - b. North Korean invasion (1950) of South Korea and the Korean War (1950–53): U.S. and UN intervention, Chinese participation, armistice (1953)
 - c. South Korea since the armistice: the regimes of Syngman Rhee (1948–60) and Park Chung Hee (1961–79), the assassination of Park and military coup (1979), the Kwangju uprising and its violent suppression (1980), the regime of Chun Doo Hwan (1980–88), economic growth and development, constitutional reforms and direct presidential elections of Roh Tae Woo (1987) and Kim Young Sam (1992)
 - d. North Korea since the armistice: consolidation of Communist government power under Kim Il-sung, relations with the Soviet Union and the People's Republic of China, military and industrial growth, death of Kim Il-sung (1994)

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and a biography dealing with East Asia: China in revolution, the era of Japanese hegemony, and the influence of the United States in the 20th century

Asia	Japan	Nanking	Tientsin
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General subjects

<i>China:</i>	May Thirtieth	kamikaze	Singanhoe
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Long March	Democratic	March First	Demands
Maoism	Socialist Party	Movement	United Front
May Fourth	Japan Communist	Pueblo Incident	
Movement	Party		

Biographies

<i>China:</i>	Soong, T.V.	Inukai Tsuyoshi	Yamamoto
Chang Kuo-t'ao	Soong	Ishibashi Tanzan	Gonnohyōe
Chang Ping-lin	Ch'ing-ling	Katō Takaaki	Yamamoto
Chen Boda	Sun Yat-sen	Kawakami Hajime	Isoroku
Chen Duxiu	Ts'ai Yüan-p'ei	Kishi Nobusuke	Yoshida Shigeru
Chiang Ching-kuo	Tuan Ch'i-jui	Konoe Fumimaro	Yoshino Sakuzō
Chiang Kai-shek	Wang Ching-wei	Miki Takeo	<i>Korea:</i>
Deng Xiaoping	Yüan Shih-k'ai	Minobe Tatsukichi	Chun Doo Hwan
Feng Yü-hsiang	Zhao Ziyang	Miyazawa Kiichi	Kim Chong Il
Guo Moruo	Zhou Enlai	Nagano Osami	Kim Dae Jung
Hu Han-min	Zhu De	Nosaka Sanzō	Kim Il-sung
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Hu Yaobang	Akihito	Ōkuma Shigenobu	Park Chung Hee
Hua Guofeng	Araki Sadao	Satō Eisaku	Rhee, Syngman
Jiang Qing	D'Aquino, Iva	Shidehara Kijūrō	Roh Tae Woo
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Kuo T'ai-ch'i	Hamaguchi Osachi	Tanaka Giichi	Hurley, Patrick J.
Li Dazhao	Hatoyama Ichirō	Tanaka Kakuei	MacArthur,
Lin Biao	Hirohito	Tōjō Hideki	Douglas
Liu Shaoqi	Hosokawa	Ugaki	Reischauer,
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- b. Increased strength of the Muslim League, movement for a separate Muslim state (Pakistan), the political and economic effects of World War II, partition and independence (1947)

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- a. Domestic affairs: establishment of a parliamentary system and reorganization of the states under Nehru and the Congress Party (1947-64); administrations of Lal Bahadur Shastri

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- b. Foreign policy: Nehru's policy of nonalignment, conflicts with Pakistan over Kashmir (1947–49 and 1965–66) and over East Pakistan (Bangladesh) in 1971, border conflict with China and Chinese incursion (1962), Indian peace-keeping troops in Sri Lanka (1987–1990)

3. Pakistan since 1947

- a. National consolidation (1947–51) under Mohammed Ali Jinnah and Liaquat Ali Khan, economic and political instability
- b. Military government of Ayub Khan (1958–69); economic and political reforms; border conflict with India; administration of Yahya Khan (1969–71); civil war between East and West Pakistan, secession of East Pakistan (since 1971, Bangladesh); administrations of Zulfikar Ali Bhutto (1971–77), Mohammad Zia-ul-Haq (1977–88), Benazir Bhutto (1988–90, 1993–96), and Nawaz Sharif (1990–93, 1997–)

4. Bangladesh since 1971: emergence of nation, government of Mujibur Rahman (1972–75), adoption of presidential form of government (1975), martial-law administrations of Zia ur-Rahman (1975–81) and Hossain Mohammad Ershad (1982–90), election of Begum Khaleda Zia ur-Rahman as prime minister and return to parliamentary system (1991)

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- a. Nationalism and demands for constitutional reform (1920–31), the 1931 constitution and the granting of universal franchise
- b. Dominion status (1947); parliamentary rule by United National Party (1947–56, 1960, 1965–70, and 1977–78) and by Sri Lanka Freedom Party (1956–60, 1960–65, and 1970–77); the constitution of 1972 and the establishment of a presidential system in the constitution of 1978; presidency of J.R. Jayawardene (1978–89) and succession by Ranasinghe Premadasa (1989); insurgent campaign for an independent Tamil state and protracted civil war; assassination of Premadasa (1993); election of Chandrika Kumaratunga (1994)
- 6. Tibet since 1920: defense of frontier against China; Chinese invasion (1950) and the reestablishment of Chinese hegemony, complete Chinese government control after 1959; suppression of violent protests against Chinese rule (1987)
- 7. Nepal since 1920: British withdrawal (1947) and revival of Nepalese royal control under Tribhuvan (1951–55), Mahendra (1955–72), and Birendra (crowned 1975); nationwide political unrest (1990) and the establishment of a constitutional monarchy (1990)

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- a. Emergence of Burmese nationalism and the British response (1920–37), limited constitutional government (1937–42), the Japanese occupation (1942–45)
- b. Postwar independence of Burma (1948) under U Nu, adoption of leftist–neutralist position, internal conflict and military government under U Ne Win (1962–81), continued economic problems, socialist state and new constitution (1974), minority insurgencies, military coup (1988), adoption of the name Myanmar (1989), victory of National League for Democracy in multiparty elections (1990), continued military repression

2. Malaya (Malaysia) and Singapore since 1920

- a. Malaya and Singapore from 1920 to 1965: British economic policies in Malaya, Japanese occupation (1942–45), British return to power (1945) and progress toward self-government, suppression of Communist insurgents (1948–60), creation of Federation of Malaya (1948) and reestablishment as Malaysia (1963), Singapore's withdrawal (1965) and creation of independent Republic of Singapore
- b. Malaysia since 1965: dominance of United Malays National Organization, communal tension and nationwide state of emergency (1969–70), introduction of New Economic Policy (1971), industrialization and exploitation of timber and oil resources, resignation of Prime Minister Datuk Hussein Onn and succession by Mahathir bin Muhammed (1981), the New Development Policy (1991)
- c. Singapore since 1965: People's Action Party (PAP) regime of Lee Kuan Yew (1965–90), rapid economic growth and sustained prosperity, authoritarian style of government and lack of effective political opposition, resignation of Lee and succession by PAP member Goh Chok Tong (1990)

3. Thailand since 1920

- a. Post-World War I escape from unequal treaties, problems of kingship and repression, the coup d'état of 1932 and the establishment of constitutional monarchy, militaristic and pro-Japanese nationalism, the Japanese occupation during World War II
- b. Loss of wartime gains and political instability, military domination (1947–68, 1971–73, and 1976–92), border incursions from Cambodia and influx of refugees; constitutional reforms and return to civilian government (1992)

4. Indochina since 1920: emergence of independent states and continued strife

- a. French administration of Vietnam, Cambodia, and Laos: Vietnamese nationalist movements and formation of the Indochina Communist Party (1930), Japanese occupation in World War II, postwar French administration in southern Vietnam and Cambodia
- b. Ho Chi Minh's government in northern Vietnam and the French attempt to reconquer the north (1946–54), the Geneva Accords and legal temporary division of Vietnam (1954), French withdrawal and limited U.S. intervention
- c. Vietnam from 1955 to 1975
 - i. North Vietnam: industrialization, relations with other communist and other Asian countries, war with South Vietnam, U.S. military intervention, cease-fire agreement (1973), conquest of South Vietnam (1975)
 - ii. South Vietnam: civil war and formation of National Liberation Front (1960), U.S. military intervention, cease-fire agreement (1973), end of regime of Nguyen Van Thieu, conquest by North Vietnam (1975)
- d. Socialist Republic of Vietnam: establishment of united Vietnamese government (July 2, 1976), political and economic problems, invasion (1978) and occupation of Cambodia, exodus of ethnic Chinese refugees and border war with China (1979), withdrawal from Cambodia (1989), economic reforms in the 1980s and early 1990s, improved relations with Asian and Western nations, economic growth
- e. Laos since 1950: civil war to 1954, Geneva Conference (1954) and creation of Laos as a neutral state, domestic instability and continued civil war between Pathet Lao and rightists, military involvement of the U.S. and North Vietnam, Pathet Lao victory and the Lao People's Democratic Republic (from 1975), domination by Vietnam in the 1980s, first parliamentary elections (1989) and new constitution of 1991
- f. Cambodia since independence (1953): Sihanouk's domestic politics and severing of relations with the U.S. (1965); deposition of Sihanouk (1970) and Lon Nol and pro-Western realignment; capture of Phnom Penh by communist Khmer Rouge forces (1975); establishment of Democratic Kampuchea (1976); brutal collectivization and resettlement campaign and political persecution, resulting in large-scale deaths; invasion of Cambodia by Vietnamese forces and establishment of Vietnamese-dominated regime (1978–79); formation of coalition government-in-exile (1982), return of Sihanouk and the monarchy (1993)

C. Indonesia and the Philippines

1. Indonesia since 1920

- a. Dutch administration of Indonesia from 1920 to independence in 1949
 - i. Dutch suppression of nationalist and communist revolts in the 1920s and 1930s, accommodation with moderate nationalist parties, Japanese occupation in World War II
 - ii. Sukarno's proclamation of Indonesian independence (1945), Dutch attempt to regain control and UN intervention, formal granting of independence in 1949
- b. Constitutional democracy (1950) and Guided Democracy (1957–65) under Sukarno; military coup (1965), mass executions of communists and Sukarno's loss of influence; administration of Suharto (from 1966); invasion and occupation of East Timor (since 1975); massive depopulation of East Timor due to starvation and military action; economic effects of the oil boom

2. The Philippines since 1920

- a. Economic and social policies of U.S. administration in the 1920s and 1930s, growth of nationalist political parties, establishment as a commonwealth (1935), Japanese occupation (1941–45), return of U.S. control and commonwealth status
- b. Establishment of the Republic of the Philippines (1946), political developments under successive presidents, U.S.-Philippine relations, administration of Ferdinand E. Marcos (1965–86), communist and Muslim insurgencies, rule under martial law (1972–81), assassination of Benigno Aquino (1983) and resulting unrest, exile of Marcos (1986), administration of Corazon Aquino (1986–1992), election of Fidel Ramos (1992)

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and a biography dealing with South and Southeast Asia: the late colonial period and the emergence of new nations since 1920

Asia	Delhi	Indonesia	Philippines
Bangkok	Gandhi	Jakarta	Southeast Asia
Bangladesh	Hong Kong	Manila	Sri Lanka
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MICROPAEDIA: Selected entries of reference information; see also Sections 968, 969, and 971

General subjects

<i>Indian subcontinent:</i>	Rowlatt Acts	Viet Cong	Hare-Hawes-
Delhi Pact	Servants of India	Viet Minh	Cutting Act
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Biographies

<i>Indian subcontinent:</i>	Naidu, Sarojini	Nguyen Huu Tho	Nu, U
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Ghaffar Khan,	Mohammad	Sukarno	Diosdado
Abdul	<i>Indochina:</i>	Tan Malaka,	Magsaysay,
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Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with Australia and Oceania since 1920

Australia	Pacific Islands
Melbourne	Sydney
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General subjects

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<i>Australia:</i>	Hawke, Robert	<i>New Zealand:</i>	Lange, David
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 - ii. White-settler control of Southern Rhodesia: relations with Northern Rhodesia and Nyasaland and economic, social, and political discrimination against black Africans; Portuguese rule in Angola and Mozambique
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- iii. Botswana, Lesotho, and Swaziland: British administration of the High Commission Territories, independence (1966, 1968), subsequent relations with South Africa
- iv. British Central Africa: postwar economic development in Northern Rhodesia, Southern Rhodesia, and Nyasaland; the Federation of Rhodesia and Nyasaland (1953–63); rise of black nationalist movements; independence of Zambia and Malaŵi (1964), governments of Kaunda (1964–91) in Zambia and Banda (1964–94) in Malaŵi
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- vi. Developments in the Portuguese colonies of Angola and Mozambique: economic advances, nationalist movements, and independence in the mid-1970s; civil war in Angola and intervention by South African and Cuban troops, prolonged guerrilla warfare in Angola and Mozambique in the 1980s; Mozambique-South Africa nonaggression pact (1984); short-lived peace agreements in Angola and withdrawal of Cuban troops (1991); multiparty Angolan elections (1992) and resumption of conflict; end of guerrilla war in Mozambique (1992)

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and a biography dealing with Southwest Asia and Africa: the late colonial period and the emergence of new nations in the 20th century

Afghanistan	Cyprus	Jordan	Syria
Africa	Eastern Africa	Lebanon	Transcaucasia
Arabia	Egypt	North Africa	Turkey and
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MICROPAEDIA: Selected entries of reference information; see also Section 96/11

General subjects

<i>central Africa:</i>	Camp David	United Arab	Lausanne,
Belgian Congo	Accords	Republic	Treaty of
Moyen-Congo	Druze revolt	Wafd	Moscow,
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<i>eastern Africa:</i>	Gaza Strip	Algerian Reformist	African National
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South West Africa People's Organization United Party	western Africa: Biafra British West Africa	French West Africa Mali Federation Togoland	other: EOKA
<u>Biographies</u>			
<i>central Africa:</i>			
Boganda,	Nahḥās Pasha,	Qāsim, Abd	Bayar, Celāl
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Introduction to Part Ten: Knowledge Become Self-conscious

by Mortimer J. Adler

The words *universe* and *encyclopaedia* have an obvious similarity of meaning. Both come from words—in the one case, Latin, in the other, Greek—that mean a totality or all-inclusive whole. Whether the universe is finite or infinite, and however it is constituted or organized, it embraces everything that is. Nothing lies outside it; everything that happens occurs within it. Can one say, with equal assurance, that the encyclopaedia is a similar totality or whole? Perhaps we cannot say that of any actual, historic encyclopaedia. But that is the ideal which all encyclopaedias attempt to embody.

It is not just the similarity of the universe and the encyclopaedia as totalities or wholes that interests us, but also how these two wholes are related to each other. One of them, the universe, embraces not only everything that is, but also everything that is knowable. The other, the encyclopaedia, sets for itself the goal of reporting everything that is and can be known about the universe. The one is mirrored or reflected in the other—the macrocosm in the microcosm.

The universe includes man—man a moving body, man a living organism, man a social animal, and man not only as a doer and seeker but also as a maker and knower of things. Among the things that man seeks to know and understand is his own knowledge—his abilities, efforts, and achievements in the sphere of knowing itself. Whether or not Aristotle was correct in saying that the highest form of intellectual activity is thinking about thinking itself, it is certainly true that “knowledge become self-conscious” is a distinctive characteristic of the human enterprise of knowing. We not only seek to know whatever can be known, but we also, reflexively, turn our knowing back upon itself when we pay attention to how we know what we know, the various ways in which we know, and the divisions or branches of our knowledge.

The organization of the encyclopaedia—the way in which the branches of knowledge have been distinguished from one another and related to one another—has changed remarkably from age to age. In antiquity, before there were any real encyclopaedias, learned men envisaged the whole of human knowledge as having a certain structure of related parts or subdivisions. The organization of knowledge in medieval encyclopaedias exhibited quite a different pattern. Later encyclopaedias introduced still other changes in the picture; and that picture has changed in important respects during the last century and is undergoing further changes today.

The new *Britannica* presents us with an outline of knowledge that is radically different in its fundamental framework and its organizational scheme from the outlines that might have been constructed for an ancient encyclopaedia—if there had been any such thing—or a medieval one. The Outline of Knowledge set forth in this

Propædia volume is divided into ten parts, each of which is broken down into divisions and sections. Division by division, from Part One through Part Nine, the outline covers what we know about the universe with the help of such sciences as physics, chemistry, astronomy, geology, meteorology, biology, medicine, psychology, anthropology, sociology, political science, economics, and technology. It also covers what we know as a result of systematic study and scholarship in such fields as education, law, the arts, religion, and history.

The knowledge of the universe that we possess by means of the disciplines mentioned above is outlined in Parts One through Nine and expounded in the articles to which the outline refers. What about Part Ten—the part to which this essay is an introduction? Where and how does that fit into the picture?

To some extent the answer has already been given. Here in Part Ten we are concerned with “knowledge become self-conscious”—with knowledge about knowledge—with our knowing turned, reflexively, back upon itself. Here it is not the knowable universe we are considering. It is, instead, the world of knowledge itself: its diverse disciplines, modes of inquiry, fields of scholarship or systematic study—in short, as the title of Part Ten indicates, the branches of knowledge. Whereas the other nine parts of the Outline of Knowledge cover *what we know* about the knowable universe, the outline of Part Ten covers what we know about the sciences or other disciplines *whereby we know* that which we know.

The answer just given is not the whole answer to the question provoked by the special character of Part Ten. What we know about the various sciences and the diverse disciplines that comprise the world of knowledge almost always includes an account of the methods of inquiry, verification or demonstration, and argument employed by scientists or scholars in a particular field of knowledge. While interest in such matters does not exhaustively represent the concerns of logic, the science of logic does provide the underpinnings for our study of the methodology of the other learned disciplines, including history and philosophy as well as the various sciences. What we know about logic itself as a science—its history and, as it were, the philosophy of it—therefore properly belongs in the outline of Part Ten, together with an indication of the scope and content of the science itself.

For a somewhat different reason mathematics is also treated here in the same way as logic. The knowledge attained by the mathematician has extraordinarily wide and diverse applicability in other spheres of inquiry and branches of knowledge—in most, if not all, of the natural sciences and in many of the social sciences. Like logic, mathematics belongs here not only for its usefulness in other sciences, but also for its own sake as a science. We

are concerned with its content as well as with its method, history, and philosophy.

In addition to logic and mathematics, two other disciplines occupy a special place in any consideration of the branches of knowledge. One is history; the other, philosophy.

History as a field of study includes more than the history of peoples, of nations, of cultures, and of social institutions. It includes the history of human learning itself, of all the branches of knowledge. It includes not only the history of the natural and social sciences, but also the history of logic, of mathematics, of philosophy, and of history itself as one of the learned disciplines. And, in addition to there being a history of the study of history (*i.e.*, historiography), there is also a logic of history (its methodology) and a philosophy of history.

Like history, philosophy is operative in the study of all the other disciplines as well as of itself. Philosophy becomes self-conscious is concerned with questions about the nature and scope of philosophy, about whether it has a method or methods and a subject matter or subject matters peculiarly its own. Philosophy is also concerned about its own historical development and, in that history, about its changing relationship to other disciplines, especially to religion and to the sciences. As there is a history and a philosophy of history, so there is a philosophy of philosophy and a history of philosophy—a statement which probably cannot be made about any other two disciplines in the entire range of the branches of knowledge.

In addition, as each of the other disciplines has a history, so there is a philosophy of each of the other disciplines. We have already noted that there is a philosophy of logic and of mathematics. So, too, there is a philosophy of science in general and of the different sciences in particular; and also a philosophy of education, of law, of art, and of religion.

All of this, however, does not exhaust the content of philosophy, any more than the history of all the branches of knowledge exhausts the content of history, or any more than the application of logic and mathematics to other disciplines exhausts their content as disciplines with knowledge to offer. But in the case of philosophy, as not in the case of logic and mathematics, it is sometimes questioned whether it can rightly claim to offer us knowledge of the universe as well as knowledge about knowledge itself and an understanding of the various branches of knowledge. That question, together with the question of how the knowledge that philosophers claim to have stands in relation to other forms of knowledge, constitutes what is, perhaps, the most fundamental problem dealt with by philosophers when they philosophize about philosophy itself. Whether or not the knowledge they claim to have is comparable in its validity to the knowledge achieved in other spheres of inquiry, philosophy, like science, covers a wide range of subject matters and involves a large number of distinct subdivisions, each with its own problems and controversies (*e.g.*, metaphysics, philosophy of nature, epistemology, philosophy of mind, philosophy of man, ethics, political philosophy, and aesthetics).

Concerning the whole range of disciplines that are represented in an exhaustive inventory of the branches of knowledge, three questions stand out as the most challenging. Of these, the first two have been debated over and over

again—in earlier epochs as well as in our own century, and in the context of organizations of knowledge quite different from that which prevails or is acceptable today.

One is the question about whether the various branches of knowledge can or should be arranged in a hierarchical order, in an ascending scale from lower to higher, or from less to more fundamental. In antiquity they were so arranged; as, for example, in Aristotle's ordering of the speculative sciences, beginning with physics and rising through mathematics to metaphysics as the science of first principles and ultimate causes; and in his characterization of politics as the architectonic or controlling discipline in the sphere of practical knowledge, directive of human action. So, too, in the Middle Ages, a hierarchical organization prevailed, in which theology was regarded as queen of the sciences, philosophy as its handmaiden, with all the other disciplines contributing their portions of knowledge for the greater glory of God and for the better understanding of man's destiny under Divine Providence. If, in accordance with the prevailing view today, a hierarchical order is rejected, is there any other order to replace it, and in terms of what criteria or principles can such an alternative be constructed? Is there, as the introductory essay in this volume suggests, a circle of learning instead of a hierarchy of the branches of knowledge—a circle in which no point is either a beginning or an end, and lines can be drawn from any point to any other?

The second question, to which different answers have been given at different times and to which conflicting answers are still being given today, asks about the coherence of the world of knowledge as a whole. Do all its constituent parts—its various component disciplines or branches of knowledge—adhere together harmoniously, each somehow complementing the other? Or, on the contrary, is the world of knowledge torn asunder by irremediable conflicts—by territorial disputes, by conflicting claims to sovereignty, by assertions and denials of legitimacy? Underlying whatever answers may be given to these questions, a deeper difference of opinion may exist concerning the unity of truth itself. If, for example, there is some truth in science and some truth in philosophy or in religion, must these diverse approximations of whatever truth man can possess be consistent with one another? Or, on the contrary, can there be some truth in science and some in philosophy or in religion, even though the truth of the one stands in sharp conflict to the truth of the other? Can there be, in short, a multiplicity of truths, each of which deserves that name, but each of which must be kept out of contact with the others, by being isolated in logic-tight compartments?

Unlike the two preceding questions, the third is one that has come to the forefront only recently. It concerns what many contemporary commentators regard as an unfortunate rift in the realm of knowledge—the chasm between the sciences, on the one hand, and the humanities, on the other. In the long history of the latter term, different disciplines have been grouped together on the side of the humanities and in contradistinction to the sciences. Today, the humanities group is generally thought to include language and literature, the fine arts, history, philosophy, and religion.

It is assumed that there are fundamental differences, in method or approach and in criteria of validity, between the

humanistic disciplines, on the one hand, and the sciences, both natural and social, on the other. Of course there are, but they are not entirely clear. By reference to methodology or to criteria of validity, certain of the disciplines called humanistic closely resemble those called scientific. For example, mathematicians and logicians do their work by sitting still and thinking, not by undertaking experiments or by going out into the field to collect data or do research. Philosophy is like them in this respect; but mathematics and logic are usually regarded as sciences, whereas philosophy is grouped with the humanities. Furthermore, the criteria of validity thought to be applicable to philosophy do not operate as criteria for judging the excellence of literature or of other fine arts, yet all three are classified as humanities.

Supposing that some line can be clearly drawn to divide the humanities from the sciences, the problem that agitates those who contemplate the world of learning is whether it is one world or two—whether the rift or chasm that separates the sciences from the humanities involves an iron curtain that prevents communication between them. It is not within the purpose or the province of this essay to provide an answer to that question. Nevertheless, an answer would appear to be suggested by the conception of the encyclopaedia as a totality, as an organized whole. That conception would seem to favour the view that, in the circle of learning, there are no impenetrable barriers to communication or unbridgeable breaks in continuity. Underlying it is the faith that the whole world of knowledge is a single universe of discourse.

Part Ten. The Branches of Knowledge

Several points should be noted about the relations of this part to the preceding parts. The results of investigations in the natural and social sciences, and in medicine and technology—their content or knowledge—are set forth in Parts One through Five, and in Part Seven. Accordingly, the outlines in the seven sections of Division III in this part are confined to questions about the history of these disciplines, and about their nature, scope, structure, methods, and principal problems or tasks. Direct historical accounts of the peoples and civilizations of the world are set forth in Part Nine, whereas Section 10/41 in Division IV of this part is confined to historical and analytical studies of the discipline of history itself, treating the history of historical writing, the methods of modern historical investigation and research, speculative philosophies of history, and philosophical analyses of the specific character of historical knowledge.

The case is different with Divisions I, II, and V—on logic, mathematics, and philosophy. The results of these disciplines have not been dealt with in previous parts. In the history of each of these disciplines, substantive developments have persistently involved, and issued from, positions taken not only *within them*, but also from positions taken *about them*. Accordingly, the outlines in the sections of Divisions I, II, and V treat the substantive results of logical, mathematical, and philosophical inquiry, on the one hand, and the historical and analytical studies of the nature, scope, branches, methods, and principal problems of logic, mathematics, and philosophy, on the other.

In Part Six on the arts and Part Eight on religion, the outlines include historical and analytic studies of knowledge and inquiry concerning the arts and religion. Such studies, then, are not included separately in Part Ten. They are, however, treated in Section 10/42 of this part, insofar as the study of the arts and of religion are, together with the study of language, history, and philosophy, component disciplines of the humanities—a group of disciplines traditionally distinguished from the natural and social sciences, and traditionally considered to have, taken together, a special educational and cultural role. Section 10/42 sets forth a historical review of the changing conceptions of the humanities and of humanistic scholarship, and treats issues about the definition and scope of the humanities, about their distinction from the sciences, and about their role in education and culture.

Division VI, which contains only one section, differs from other divisions in that it is not discipline-specific; to the contrary, it deals with the institutions and techniques used to preserve knowledge, and certain objects of knowledge, in all fields.

Division I. Logic 479

II. Mathematics 483

III. Science 492

IV. History and the Humanities 509

V. Philosophy 513

VI. Preservation of Knowledge 522

Division I. Logic

The outlines in the two sections of Division I deal with the history and philosophy of logic and with the content of the disciplines of formal logic, metalogic, and applied logic.

The outline in Section 10/11 first treats the history of logic in the West and the history of Indian and Chinese logic; and then treats differing conceptions of the field and scope of logic, problems in the philosophy of logic concerning meaning, truth, and ontology, and the place of logic among the sciences and disciplines.

Section 10/12 deals first with formal logic, treating the propositional calculus, the predicate calculus, the theory of the syllogism, modal logic, and set theory and natural-number arithmetic. It goes on to the nature and elements of metalogic, which studies the syntax and semantics of formal languages, formal systems, and logical calculi. Finally, it deals with the applications of logic in different domains of inquiry and discourse.

Section 10/11. History and Philosophy of Logic 480

10/12. Formal Logic, Metalogic, and Applied Logic 481

Section 10/11. History and Philosophy of Logic

A. History of logic

1. Ancient logic

- a. Precursors of ancient logic: contributions of the Sophists, Socrates, and Plato to theories of language and the axiomatic method
- b. Aristotle and the logic of predicates: theories of the structure of language, theories of opposition and conversion, development of syllogistic and modal logic
- c. Later developments in the logic of predicates: contributions of Theophrastus and Galen
- d. Founding of the logic of propositions: contributions of Theophrastus and the Megarians, Stoic logic

2. Medieval logic

- a. Development of medieval logic: Arabic contributions, disputes between the “old logic” and the “new logic” after the translation of Aristotle’s *Organon*, summations by William of Sherwood and Peter of Spain
- b. Medieval theories of language and their relation to the development of logic: the theory of categorematic and syncategorematic terms, the theory of supposition
- c. Medieval developments in formal logic: the logic of predicates, of propositions, and of modal expressions; logical fallacies and paradoxes

3. Modern logic from the Renaissance to the 20th century

- a. Logic in the Renaissance: the influence of Neoplatonism and of the rise of the natural sciences, the logics of Petrus Ramus and of Port-Royal
- b. The rise of mathematical logic during the Enlightenment: contributions of Leibniz (*e.g.*, his general calculus of reasoning and general methodology), the search for clarity and the use of diagrams
- c. Development of mathematical logic in the 19th century: expansions of syllogistic, Boole’s algebra of logic, refinements of the calculus, the study by Frege and Cantor of the relation between logic and the foundations of mathematics

4. Logic in the 20th century

- a. The conflict of Logicism, the view that mathematics is a continuation of logic, with Intuitionism and Formalism: Russell’s Logicism and the theory of types, Brouwer’s Intuitionism, Hilbert’s Formalism
- b. Developments in the logic of propositions and in the logic of predicates
- c. Metalogical studies: the study of the properties of axiomatized systems; syntax and semantics as metalogical disciplines

5. Logic in the East

- a. Indian logic: its origins in the commentaries on the scriptural texts called *sūtras*, special problems in grammar and special types of inference, interest in the logical implications of the notion of negation
- b. Chinese logic: its origins in reflections on the characteristics of controversies between the major philosophies of Confucianism, Taoism, and Moism; its neglect after the establishment of Neo-Confucianism in the 11th century AD

B. Philosophy of logic

1. The organization of logic as a discipline

- a. The nature and varieties of logic: differing conceptions of its field and scope, varieties of logical symbolism
- b. Features and problems of logic: concerns with logical semantics or model theory, questions of the limitations of logic, Gödel’s incompleteness theorems, the question of logic and computability

2. Issues and developments in the philosophy of logic

- a. Problems in meaning and truth: logical semantics of modal concepts, logic and informativeness

- b. Problems of ontology: problems concerning individuation and existence
- c. Alternative logics: modal logics, intuitionistic logic
- 3. The place of logic among the sciences and disciplines

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the history and philosophy of logic

Logic, The History and Kinds of
Philosophies of the Branches of Knowledge

MICROPAEDIA: Selected entries of reference information

General subjects

analogy	axiom	ekthesis	thought, laws of
analytic	De Morgan laws	fallacy	types, theory of
proposition	dialectic	induction	universal

Biographies

Boole, George	Leibniz, Gottfried	Peirce, Charles	Socrates
Carnap, Rudolf	Wilhelm	Sanders	Whitehead, Alfred
Frege, Gottlob	Leśniewski,	Ramus, Petrus	North
Gödel, Kurt	Stanislaw	Russell, Bertrand	

See also Sections 10/51, 10/52, and 10/53

INDEX: See entries under all of the terms above

Section 10/12. Formal Logic, Metalogic, and Applied Logic

A. Formal logic

1. The propositional calculus: the logic of unanalyzed sentences in combination
 - a. General features of the propositional calculus: symbols employed for propositional connectives or operators (*i.e.*, “not,” “and,” “or,” “if . . . then,” “is equivalent to”), propositional variables
 - b. Special systems of the propositional calculus
2. The predicate calculus: the logic of quantified functions of terms
 - a. General features of the predicate calculus: individual variables and predicate variables, universal and existential quantifiers (*i.e.*, “any” or “all,” “some” or “one”)
 - b. The lower predicate calculus: the logic of individual variables
 - c. Higher order predicate calculi: the logics of classes of variables
3. Syllogistic: the theory of the syllogism
4. Modal logic: the logic of necessity, possibility, and contingency; systems of and validity in modal logic
5. Set theory and natural-number arithmetic

B. Metalogic: the study of the syntax and the semantics of formal languages, formal systems, and logical calculi

1. The nature and elements of metalogic
2. The nature of a formal system and of a formal language
3. Discoveries about formal mathematical systems: completeness and consistency, decidability and undecidability
4. Discoveries about logical calculi
5. Model theory: the study of the interpretations, or models, that satisfy the axioms of a given formal system

C. Applied logic

1. The critique of forms of reasoning
 - a. Theory of argumentation: the new rhetoric
 - b. Analysis of logical fallacies: material, verbal, and formal fallacies
2. Epistemic logic: logic dealing with the concepts of belief, knowledge, assertion, doubt, and question
3. Practical logic: logic dealing with the concepts of choosing, planning, commanding, and permitting
4. Logics of physical application
5. Hypothetical reasoning and counterfactual conditionals: logic involving consequents whose antecedents are known to be false

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with formal logic, metalogic, and applied logic

Logic, The History and Kinds of
Rhetoric

MICROPAEDIA: Selected entries of reference information

General subjects

analytic	deduction	modus ponens and	rhetoric
proposition	dichotomy	modus tollens	set theory
axiom	dilemma	mood	sylogistic
axiomatic method	enthymeme	predicate calculus	
categorical	formal system	predication	
proposition	logic	propositional	
condition	metalogic	calculus	
connective	modal logic	recursive function	
conversion	modality	reduction	

Biographies

Antiphon	Lewis, C.I.	Quintilian
Isocrates	Peano, Giuseppe	Zeno of Elea

See also Sections 10/51, 10/52, and 10/53

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Division II. Mathematics

[For Part Ten headnote see page 479.]

The outlines in the three sections of Division II treat the history and foundations of mathematics, the branches of mathematics, and the applications of mathematics.

Section 10/21 deals first with the general history of mathematics, with the development of representative non-probabilistic areas of mathematics, and with the historical development of probabilistic areas. The treatment of the foundations of mathematics covers the axiomatic method, the genetic method, 20th-century rival formulations of the foundations of mathematics, and current investigations of the foundations of mathematics.

Section 10/22, the branches of mathematics, first treats set theory, arithmetic, elementary multivariate algebra, linear and multilinear algebra, and algebraic structures, including the subjects of homological algebra and universal algebra. It goes on to deal with Euclidean and non-Euclidean geometry, projective geometry, analytic and trigonometric geometry, differential geometry, and algebraic geometry. It then deals with the subdivisions of mathematical analysis: real analysis, complex analysis, differential equations, functional analysis, Fourier analysis, the theory of probability, and vector and tensor analysis. The outline next deals with combinatorics and combinatorial geometry, and with number theory. Finally, it treats topology: general topology, topological groups and differential topology, and algebraic topology.

Section 10/23, applications of mathematics, first treats mathematics as a calculatory science and then goes on to deal with statistics, numerical analysis, definitions and examples of automata and the development of automata theory, the mathematical theory of optimization, information theory, and the mathematical aspects of physical theories.

Section 10/21. History and Foundations of Mathematics 483

10/22. Branches of Mathematics 485

10/23. Applications of Mathematics 490

Section 10/21. History and Foundations of Mathematics**A. History of mathematics**

1. The development of mathematics in general, through ancient, medieval, and modern times
 - a. Ancient and medieval periods
 - i. Ideas and methods originating or developing in Mesopotamia and Egypt
 - ii. Greek and Hellenistic mathematics
 - iii. The Middle Ages: Islāmic mathematics and its transmission to the West
 - b. The modern period
 - i. The 17th century: discovery of logarithms and analytic geometry, development of calculus by Newton and Leibniz
 - ii. The 18th century: advances in geometry, algebra, and analysis; contributions of the Bernoulli family, Euler, Lagrange, Laplace, and others
 - iii. The 19th and 20th centuries: development of non-Euclidean geometry by Bolyai, Lobachevsky, and others; contributions to the theories of groups, functions, and complex variables; development of algebraic geometry; influence of physical science on analysis; study of the foundations of mathematics
2. Historical development of representative nonprobabilistic areas of mathematics
 - a. Numerals and numeral systems
[see also 10/23.A.1.]
 - i. Simple grouping systems: ancient Egyptian, Babylonian, Greek, and Roman numerals
 - ii. Development of multiplicative, ciphered, and positional numeral systems
 - b. Introduction of symbolic notations to represent mathematical quantities, operations, and relationships
 - c. Calculatory science
[see also 10/23.A.]
 - i. The history of mathematical tables, including tables of logarithms
 - ii. The evolution of analogue devices: origins of harmonic analyzers, differential analyzers, and the slide rule

- iii. The evolution of digital devices: development of computational aids from the abacus to the modern electronic digital computer
[see 10/23.A.7.]

d. Geometry

[see also 10/22.C.]

- i. Egyptian, Babylonian, and Greek geometry
- ii. The algebraic approach: development of analytic geometry
- iii. Development of projective geometry
- iv. Development of non-Euclidean geometry
- v. Philosophical aspects of geometry
- vi. Modern ideas and topics in geometry: the axiomatic method; geometrical transformations; the concept of space, differential geometry, and topology

e. Algebra

[see also 10/22.B.]

- i. Babylonian, Egyptian, and Greek contributions
- ii. Contributions from the Orient, India, and the Islāmic world
- iii. Medieval and modern European developments
- iv. Evolution of the theory of algebraic equations of one variable: solutions prior to and after Galois

3. Historical development of probabilistic areas of mathematics

[see also 10/22.D.6.]

a. Development of the mathematical theory of probability

- i. The abstract calculus of probability: the common structure of theories of probability
- ii. Alternative views of probability: the frequency theory of probability, the range theory of probability and the principle of indifference, the belief theory of probability, subjective and objective notions of probability
- iii. Bernoulli's theorem, inverse probability, and asymptotic probabilities

b. Development of mathematical statistics: the history of the theory of stochastic processes, origins of control theory

B. Foundations of mathematics

1. The axiomatic method: mathematical analysis based upon a set of axioms, or unproved statements

a. Euclidean geometry

[see also 10/22.C.1.]

b. Non-Euclidean geometry

[see also 10/22.C.2.]

c. The formal axiomatic method

2. The genetic method: mathematical analysis based upon the orderly construction or generation of objects with unknown properties from objects with known properties

a. Arithmetic and analysis

[see also 10/22.B.1.]

b. The concept of cardinal number and the theory of sets

[see also 10/22.A.2.]

3. The crisis in the foundations of mathematics after 1900: reformulations in terms of the three alternative philosophical positions of Intuitionism, Logicism, and Formalism

a. The paradoxes

b. Intuitionism

c. Logicism, Formalism, and the metamathematical method

4. Current directions in investigations of the foundations of mathematics

a. Intuitionistic studies of the foundations of mathematics: application of formalistic procedures to Intuitionism

b. Non-Intuitionistic studies of the foundations of mathematics: trends in recursion theory, proof theory, model theory, and set theory

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with the history and foundations of mathematics

Archimedes
 Gauss
 Mathematics, The Foundations of
 Mathematics, The History of
 Pascal
 Philosophies of the Branches of Knowledge

MICROPAEDIA: Selected entries of reference information

General subjects

analysis	exhaustion,	logicism	Sturm–Liouville
Bessel function	method of	metatheory	problem
Boolean algebra	fluxion	Riemannian	transitive law
derivative	hyperbolic	geometry	
Dirichlet's theorem	geometry		

Biographies

Abel, Niels Henrik	Cayley, Arthur	Kolmogorov, A.N.	Oresme, Nicholas
Abū al-Wafā'	Clifford, William	Lagrange,	Painlevé, Paul
Apollonius of	Kingdon	Joseph-Louis	Picard, Émile
Perga	Dedekind, Richard	Lebesgue,	Plücker, Julius
Bell, Eric Temple	Diophantus of	Henri-Léon	Poincaré, Henri
Bernoulli, Daniel	Alexandria	Legendre,	Poisson,
Bernoulli, Johann	Euclid	Adrien-Marie	Siméon-Denis
Birkhoff, George	Eudoxos of Cnidus	Leibniz, Gottfried	Ramanujan,
David	Euler, Leonhard	Wilhelm	Srinivasa
Bolyai, János	Fermat, Pierre de	Leonardo Pisano	Regiomontanus
Boole, George	Fourier, Joseph,	Liouville, Joseph	Riemann,
Brouwer, L.E.J.	Baron	Lobachevsky,	Bernhard
Cantor, Georg	Frege, Gottlob	Nikolay	Steiner, Jakob
Carathéodory,	Galois, Évariste	Ivanovich	Sylvester, James
Constantin	Hamilton, Sir	Maclaurin, Colin	Joseph
Cauchy,	William Rowan	Moivre,	Thales of Miletus
Augustin-Louis,	Hero of Alexandria	Abraham de	Wallis, John
Baron	Hilbert, David	Noether, Emmy	Weierstrass, Karl

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Section 10/22. Branches of Mathematics**A. Set theory**

1. Origins of set theory and the definitions of a set and a set element, or member
2. Introduction to set theory
 - a. Fundamental set concepts
 - b. Essential features of Cantorian set theory
3. Axiomatic set theory: formal analyses of set theory based upon certain fundamental assumptions or undefined notions called axioms
 [see also 10/21.B.3.a.]
 - a. Postulates of axiomatic set theory: the Zermelo–Fraenkel axioms, the von Neumann–Bernays–Gödel axioms
 - b. Limitations of axiomatic set theory: failure of attempts to prove the consistency of axiomatic set theory, Gödel's theorem
 - c. The present status of axiomatic set theory: profound changes in axiomatic set theory as a result of recent discoveries

B. Algebra

1. Arithmetic

- a. Fundamental definitions and laws: the concepts of natural number and integer; the binary operations of addition and multiplication; the commutative and associative laws of addition; the commutative, associative, and distributive laws of multiplication
- b. Theory of divisors: extension of natural number concepts to non-integers, fractions resulting from the binary operation of division
- c. Number systems and notation: use of the positional principle and the symbol zero to specify magnitude in sequences of digits; number systems having different bases—*e.g.*, binary, decimal, and sexagesimal systems
[see also 10/23.A.1.]
- d. Arithmetic calculation with decimals: binary operations with decimals; divisibility rules; calculation of square, cube, and higher roots
- e. Logarithms: formal definition of logarithms, use of logarithms to reduce the operations of multiplication and division to the simpler operations of addition and subtraction
[see also 10/23.A.4.b.]

2. Elementary and multivariate algebra

- a. Algebra as an extension and generalization of arithmetic
- b. Basic algebraic properties of numbers
- c. Polynomials and rational functions
- d. Solution of equations: the principal problem of elementary algebra

3. Linear and multilinear algebra

a. Linear algebra

- i. Vector spaces
- ii. Matrices
- iii. Linear transformations and linear operators
- iv. Linear functionals and their relation to linear transformations
- v. Inner products and inner product spaces: self-conjugate, or Hermitian, matrices; unitary and orthogonal matrices
- vi. Linear operators in an inner product space: self-adjoint, or Hermitian, operators; unitary and orthogonal operators; the spectral theorem for normal operators

b. Multilinear algebra

4. Algebraic structures

- a. Lattices
- b. Groups
- c. Fields
- d. Rings
- e. Categories
- f. Homological algebra
- g. Universal algebra

C. Geometry

1. Euclidean geometry

- a. Geometry as an abstract doctrine: the axiomatization of the foundations of geometry; axioms of order, incidence, congruence, parallels, and continuity and results derived from them
- b. The measure of polygons and polyhedra: the theories of equivalence and measure and their relation, Euclid's contribution and its modern extension and generalization
- c. Transformation geometry: reflection, rotation, and translation of geometric figures; homotheties and similitudes
- d. Geometric constructions: the equivalence between Euclidean constructions and existence theorems, gauge constructions, ruler and compass constructions, construction with compass only

- e. Geometry of more than three dimensions: the generalization of Euclidean geometry
- f. The concept of convexity and convex sets
- 2. Non-Euclidean geometry
[see also 10/21.B.1.b.]
 - a. Distinction between Euclidean and non-Euclidean geometry: hyperbolic geometry and elliptic geometry
 - b. Geometric representations of the hyperbolic plane and hyperbolic space
 - c. Coordinates in spherical and elliptical space: interpretations of four-dimensional Euclidean space
 - d. Coordinates in the hyperbolic plane and hyperbolic trigonometry
 - e. Transformations: hyperbolic geometry as characterized by its group of reflections
- 3. Projective geometry
 - a. The procedure of projection as the foundation of projective geometry
 - b. Homogeneous coordinates: location of points in space
 - c. Complex geometry: introduction of complex numbers as homogeneous coordinates
 - d. Abstract geometries: extension and generalization of projective geometry to space of any number of dimensions
- 4. Analytic and trigonometric geometry
 - a. Plane analytic geometry: fundamental procedures and concepts
 - b. Trigonometry
 - c. Coordinates and transformation of coordinates
 - d. Projective and solid analytic geometry: extensions of analytic geometry to the projective plane and to three or more dimensions
 - e. Special curves: named curves that have been studied with regard to problems in mathematics or the physical sciences; *e.g.*, the folium of Descartes, the lemniscate of Bernoulli, the cardioid, the cycloid, the catenary, the brachistochrone
- 5. Combinatorial geometry
[see E.1.c., below]
- 6. Differential geometry
[see also F.2.e., below]
- 7. Algebraic geometry
[see also F.3., below]
- D. Analysis
 - 1. Real analysis
 - a. Origins and concepts of real analysis
 - b. Number systems and their properties
 - c. Functions and differential calculus
 - d. Measure and integral calculus
 - 2. Complex analysis
 - a. Theory of analytic functions of one complex variable
 - b. Theory of analytic functions of several complex variables
 - c. Potential theory
 - 3. Differential equations
 - a. Ordinary differential equations
 - b. Partial differential equations
 - c. Special functions that arise as solutions to differential equations; *e.g.*, the hypergeometric function, Legendre polynomials, spherical harmonics, Bessel functions
 - d. Dynamical systems on manifolds
 - 4. Functional analysis

- a. General features of functional analysis
 - b. Calculus of variations
 - c. Generalized functions: the theory of distributions
- 5. Fourier analysis
 - a. The theory of series
 - b. Fourier series
 - c. Harmonic analysis and integral transforms
 - d. Representations of groups and algebras: Fourier analysis on non-Abelian groups
- 6. Theory of probability
 - a. Heuristic introduction to probability: the need for a mathematically precise definition of probability
 - b. Probability on finite dimensional spaces
 - c. Probability on infinite dimensional spaces
- 7. Vector and tensor analysis
 - a. Scalars, vectors, tensors, and the physical quantities that give rise to them
 - b. Vector algebra and analysis
 - c. Tensor algebra and analysis
- E. Combinatorics and number theory
 - 1. Combinatorics and combinatorial geometry
 - a. The nature and scope of combinatorics: the definition of combinatorics as the branch of mathematics concerned with arrangements, operations, and selections within a finite or a discrete system
 - b. Methods, results, and unsolved problems of combinatorial theory, exclusive of geometric considerations
 - c. Combinatorial geometry
 - 2. Number theory
 - a. Elementary number theory: properties of the whole numbers, or integers
[see B.1.a., above]
 - b. Algebraic number theory: properties of algebraic numbers
 - c. Analytic number theory
 - d. Geometric number theory
 - e. Probabilistic number theory
- F. Topology
 - 1. General topology
 - a. Definition and basic concepts of topology; the subject matter and applications of topology as exemplified by certain simple topological problems and their solutions
 - b. Topological spaces: methods for constructing topological spaces; Euclidean n -dimensional space, Hilbert space, Cartesian-product space, and other examples of topological spaces
 - c. Topological properties
 - d. Topological problems of current interest; *e.g.*, the planar fixed-point problem, the polyhedral Schoenflies problem
 - 2. Topological groups and differential topology
 - a. Interaction between analysis and topology
 - b. The theorems of Tikhonov and Ascoli: embedding of a topological space as a subspace of a compact space
 - c. Continuous groups
 - d. Analysis on manifolds: topological implications of problems in global analysis
 - e. Differential topology
[see also C.6., above]

3. Algebraic topology

[see also C.7., above]

- a. The nature and scope of algebraic topology and its context within general topology, the basic concepts of topological spaces and maps
- b. Invariants: unchanging quantities that play a central role in the classification of spaces and maps
- c. Homotopy theory: homotopy classes and the concept of homotopy-equivalent spaces
- d. Homology and cohomology theory: definition of a simplex, axiomatic homology theory
- e. Homotopy groups: stability and suspension
- f. Definition and properties of fibres, fibre bundles, and fibrings
- g. Sheaf cohomology
- h. Spectral sequences: Serre, Rothenberg–Steenrod, and Eilenberg–Moore spectral sequences
- i. Further developments in homotopy theory: Eilenberg–MacLane spaces, the methods of killing homotopy groups, Serre’s C-theory
- j. Generalized homology and cohomology theory: K-theory, the spectral sequence of G.W. Whitehead–Atiyah–Hirzebruch
- k. Recent advances in algebraic topology

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the branches of mathematics

Algebra	Geometry
Analysis (in Mathematics)	Number Theory
Arithmetic	Probability Theory
Combinatorics and Combinatorial	Set Theory
Geometry	Trigonometry

MICROPAEDIA: Selected entries of reference information

General subjects

<i>algebra</i> :	infinite series	<i>geometry</i> :	Zermelo–Fraenkel
algebra	integration	algebraic geometry	axiom
binomial theorem	Laplace’s equation	analytical geometry	<i>topology</i> :
discriminant	Markov process	catastrophe theory	compactness
eigenvalue	mean-value	Desargues’s	connectedness
exponential	theorem	theorem	Euler characteristic
function	parabolic equation	differential	four-colour map
Gauss elimination	perturbation	geometry	problem
harmonic function	probability theory	duality	homology
homotopy	real number	fractal	metric space
linear equation	singular solution	geometry	topological space
logarithm	stochastic process	hyperbolic	<i>other</i> :
matrix	<i>combinatorics and</i>	geometry	arithmetic function
quarter squares	<i>number theory</i> :	projection	graph
root	combinatorics	projective	graph theory
<i>analysis</i> :	Fermat prime	geometry	mathematics
analysis	NP-complete	Riemannian	normal
calculus	problem	geometry	distribution
differential	number theory	<i>set theory</i> :	number system
equation	permutations and	Boolean algebra	numeral system
differentiation	combinations	measure	pi
Dirichlet problem	Riemann zeta	set theory	trigonometry
elliptic equation	function	transfinite number	
exact equation			

Biographies

See Section 10/21

INDEX: See entries under all of the terms above

Section 10/23. Applications of Mathematics**A. Mathematics as a calculatory science**

1. Numerical notations
 - a. Aggregations, or units used to assist counting or grouping of objects
 - b. Ancient numerical notations
 - c. Decimal notation and modern notational developments
2. Geometrical aids
 - a. Early applications of geometry
 - b. Instruments for observation and navigation
 - c. Mapping
 - d. Applications of geometry to celestial measurement
 - e. Optical instruments
 - f. Drawing instruments
3. Mathematical models: physical constructions used to aid the visualization of mathematical ideas or relationships
4. Calculatory aspects of algebra
 - a. Algebraic notation
 - b. Logarithms
 - c. Slide rules
5. Calculation using tables and graphs
 - a. Mathematical tables
 - b. Graphs and graphical procedures
6. Analogue computation
[see also 735.D.]
 - a. Types of problems solvable by analogue computation
 - b. Analogue computers
7. Digital computation
[see also 735.D.]
 - a. Digital calculators
 - b. Punched cards
 - c. Programmed machines (digital computers)

B. Statistics

1. The basic principles of statistical inference: application of the concepts and techniques of probability theory to the analysis of data
 - a. The concept of a statistical experiment: mathematical description of experiments in terms of random variables
 - b. Distribution functions and their properties: the median, mean, variance, and standard deviation of a distribution; the Gaussian or normal distribution
2. Estimation: techniques for approximating the parameters of families of distributions of random variables
3. Hypothesis testing: techniques for determining the correctness of alternative hypotheses concerning given data and an assumed probability model
4. Structure in data: use of regression analysis to discover systematic patterns

C. Numerical analysis

1. Introduction: definition, origins, and basic concepts of numerical analysis
2. Errors: round-off and truncation
3. Approximation of functions: linear and polynomial interpolation, least squares approximation

4. Solution of equations: linear, nonlinear, and differential equations
5. Applications and implementation of numerical analysis: optimization, large-scale scientific computation, mathematical software

D. Automata theory

[see also 712.A.6.]

1. Introduction: definition and examples of automata, development of the basic concepts of automata theory, the analogy between automata and the nervous systems of living organisms
2. Neural nets and automata
3. Probabilistic questions: random effects in the operation of automata
4. Classification of automata

E. Mathematical theory of optimization

1. The theory of games: analysis of the strategic features of conflict situations
2. Linear and nonlinear programming (mathematical programming)
3. Cybernetics
4. Control theory

F. Information theory

[see also 735.A.]

1. Origins and definitions of information theory
2. Central problems of information theory
3. Principles of information theory
4. Applications of information theory to cryptography, linguistics, and other fields

G. Computer science

1. Synthesis and analysis of algorithms
2. Theory of computation
3. Computer architecture
4. Programming languages and methodology
5. Numeric computation
6. Artificial intelligence

H. Mathematical aspects of physical theories

1. Mechanics of particles and systems
[see also 126.A.]
2. Fluid mechanics
[see also 126.F.]
3. Mechanics of solids
[see also 126.D.]
4. Statistical mechanics
[see also 124.A.9.]
5. Electromagnetic theory
[see also 127.E.]
6. Relativity theory: space and time as a four-dimensional continuum
[see also 131.D.]
7. Riemannian geometry
8. Quantum mechanics
[see also 111.A.4.c.]
9. Dimensional analysis

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with applications of mathematics

Automata Theory	Numerical Analysis
Computer Science	Optimization, The
Computers	Mathematical Theory of
Game Theory	Statistics
Information Processing and	
Information Systems	

MICROPAEDIA: Selected entries of reference information

General subjects

<i>computers and other</i>	input/output	mathematical	<i>other:</i>
<i>mathematical</i>	device	programming	algorithm
<i>devices:</i>	integrator	optimization	artificial
abacus	microprocessor	queuing theory	intelligence
analog computer	planimeter	<i>statistics:</i>	automata theory
calculator	quipu	decision theory	dimensional
central processing	slide rule	distribution	analysis
unit	supercomputer	function	distortion
computer	time-sharing	freedom, degree of	eigenvalue
programming	<i>numerical analysis:</i>	inference	fractal
language	difference equation	mean	gamma function
computer	interpolation	normal	graph
programs	numerical analysis	distribution	graph theory
differential	<i>optimization:</i>	sampling	information theory
analyzer	control theory	standard deviation	mathematical
differentiator	cybernetics	statistics	model
digital computer	game theory	Student's t-test	
harmonic analyzer	linear	variance	
	programming		

Biographies

Babbage, Charles	Pascal, Blaise	von Neumann,	Wiener, Norbert
Boole, George	Turing, Alan M.	John	
Napier, John		Weyl, Herman	

INDEX: See entries under all of the terms above

Division III. Science

[For Part Ten headnote see page 479.]

The results of investigations in the natural, social, and medical sciences and the achievements of technology are dealt with in Parts One through Five and in Part Seven. The outlines in the seven sections of Division III are concerned with inquiries that have viewed those sciences and technology as the objects of historical and analytical studies.

Section 10/31 deals with science taken generally. It first presents a synoptic history of Western and Eastern science. It then deals with the nature and scope of the philosophy of science, and with analyses of the empirical procedures and formal structures of science, of science's modes of discovery, and of validating concepts and theories.

Section 10/32 is on the physical sciences. The outline first deals with the historical evolution of astronomy and astrophysics, of physics, and of chemistry. Then, for each of them, it treats issues about the nature, scope, component disciplines, methods, and principal problems of the discipline.

Similarly, Section 10/33 first deals with the history of the several complementary Earth sciences, and then with studies of the nature, scope, methods, and principal problems of the geologic, hydrologic, and atmospheric sciences.

Section 10/34 is first concerned with the historical development of the biological sciences and with issues about the methodology, scope, and conceptual structure of biology as a whole. It then sets forth the work done at four levels of biological research: the molecular, cellular, organismic, and population levels. Finally, it treats issues in the philosophy of biology: issues about the nature of biological systems, issues concerning evolution and evolutionary theory, and biological issues with ethical implications.

Section 10/35 treats the history of medicine; the many specialized fields of medical practice and research; and such affiliated disciplines as dentistry, osteopathy, nursing, and pharmacy.

Section 10/36 is on the social sciences and psychology. It first deals with the general historical development of the social sciences. It then separately treats the development, nature, scope, and methods of the particular social sciences: anthropology, sociology, economics, and political science. Finally, it deals with the history, scope, and methods of psychology.

Section 10/37 treats the history of the technological sciences; the academic and professional aspects of engineering; the nature and scope of agricultural sciences; and the nature and scope of such recently developed interdisciplinary fields as bionics, systems engineering, and cybernetics.

Section 10/31. History and Philosophy of Science 493

10/32. The Physical Sciences 495

10/33. The Earth Sciences 499

10/34. The Biological Sciences 501

10/35. Medicine and Affiliated Disciplines 503

10/36. The Social Sciences and Psychology and Linguistics 506

10/37. The Technological Sciences 508

Section 10/31. History and Philosophy of Science

A. History of science

1. Introduction: problems and difficulties of tracing the development of science
2. Science in ancient and medieval Western civilization
 - a. Science in Greek civilization
 - i. Protoscience in Greece before the age of Pericles: empirical versus religious or mythological explanations of natural phenomena
 - ii. Development of scientific attitudes: the beginning of disciplined observation, inference, definition, and classification; the Platonic versus the Aristotelian view of nature
 - iii. Science during the Hellenistic Age: the emergence of Alexandria as the foremost centre of scientific research
 - b. Science in Rome: the contrast between Roman success in law and technology and Roman failure in science
 - c. Medieval science
3. Science in other civilizations: Islāmic science; science in India, China, and Japan
4. European science in the early modern period
 - a. The rebirth of science in the Renaissance
 - i. The state of science in Europe in the early 15th century
 - ii. The influence of advances in printing, mining, metallurgy, and other areas of technology: the demands placed upon science by increases in trade and exploration
 - iii. The coexistence of new scientific discoveries and old philosophical views
 - b. The revolution in natural philosophy
 - i. The radical reformulation of the objects, methods, and functions of natural knowledge: the work of Bacon, Descartes, and Galileo
[see also 10/42.A.3.]
 - ii. Results of the new philosophy: establishment of scientific societies, progress in particular fields of science
 - c. Characteristics of European science
5. Science in the age of modern revolutions
 - a. Science during the Industrial Revolution
 - b. Intellectual origins of revolution: the spirit of the Enlightenment
 - c. The institutional organization of science under the French Revolution
 - d. Romantic reaction and science: the proponents of *Naturphilosophie*
6. Science in the 19th century: difference in styles of research; progress in physics, chemistry, and biology

7. Science in the early 20th century: the social organization and style of science, the common pattern of advance in scientific research
 8. Contemporary problems and prospects: the moral, political, and environmental difficulties facing science
- B. Philosophy of science**
[see also 10/52.B.2.]
1. The nature and scope of the philosophy of science and its relation to other disciplines: the diverse concerns of and methods of approach to the philosophy of science
 2. Historical development of the philosophy of science
 - a. Classical and medieval periods: the alternative viewpoints of the Stoics and Epicureans and of the Platonists and Aristotelians
 - b. The 17th century: the debate about scientific methodology, Bacon's inductive approach and Descartes's deductive approach
 - c. The 18th century: Empiricist, Rationalist, and Kantian interpretations of Newtonian physics
 - d. From the beginning of the 19th century through World War I: the influence of Kant's belief in the unique rationality of the classical synthesis of Euclid and Newton
 - e. The 20th-century debate: responses to relativity, quantum mechanics, and other profound changes in the natural sciences; Logical Positivism versus Neo-Kantianism
 3. Elements of the scientific enterprise
 - a. Empirical, conceptual, and formal elements and their theoretical interpretation: diverse views of the relative importance of observation, theory, and mathematical formulation
 - b. Empirical procedures of science: measurement, design of experiments, classification
 - c. The formal structures of science: the problem of constructing a purely formal analysis of scientific inference, the distinction between scientific laws and empirical generalizations
 - d. Conceptual change and the development of science: historical problems concerning the changing theoretical organization of science
 4. Movements of scientific thought: the basic procedures of intellectual development in science
 - a. Scientific discovery: the extreme positions of formalism, which emphasizes the rational elements of scientific discovery, and of irrationalism, which emphasizes the role of intuition, guesswork, and chance
 - b. Validation and justification of new concepts and theories: the view that prediction is the crucial test of scientific validity; the view that coherence, consistency, and comprehensiveness are the essential requirements of a scientific theory
 - c. Unification of the theories and concepts of separate sciences: attempts to construct an axiomatic system for all of natural science, the reductionist problem of achieving a consistent conceptual basis for two or more sciences
 5. The philosophical status of scientific theory
 - a. The status of scientific propositions and concepts of entities: diverse views of the epistemological status of scientific propositions and of the ontological status of scientific concepts
 - b. The relationship between philosophical analysis and scientific practice: the application of different philosophical doctrines and approaches to different sciences
 6. The relevance of scientific knowledge to other spheres of human experience and concern: the social significance of science and of scientific attitudes, limitations on the scientific endeavour
 7. The relation between science and the humanities: questions of differences between scientific and humanistic methodologies
[see 10/42.B.3.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with the history and philosophy of science

Franklin	Locke	Philosophies of	Science, The
Galileo	Newton	the Branches of	History of
Kelvin		Knowledge	

MICROPAEDIA: Selected entries of reference information

General subjects

Baconian method	scientific theory
hypothetico-deductive method	typology
nature, law of	

Biographies

Albertus Magnus,	Bacon, Roger	Empedocles
Saint	Bruno, Giordano	Oresme, Nicholas
Anaxagoras	Buffon,	Poincaré, Henri
Anaximenes of	Georges-Louis	
Miletus	Leclerc, comte de	

INDEX: See entries under all of the terms above

Section 10/32. The Physical Sciences

A. History of the physical sciences: the evolution of astronomy, physics, and chemistry

1. History of astronomy

a. Ancient astronomy

- i. Time reckoning and astronomical prediction: development of lunar and solar calendars, prediction of eclipses and of first appearances of the New Moon
- ii. Early cosmologies
- iii. Ancient astronomical records, treatises, and star catalogs

b. Medieval astronomy: European and Islāmic contributions

c. Astronomy in the 16th and 17th centuries

- i. The geocentric and heliocentric world systems
- ii. The discovery of the laws of planetary motion
- iii. The invention and use of the telescope
- iv. The theory of universal gravitation
[see 2.c., below]

d. Astronomy in the 18th century

- i. Development of celestial mechanics: the calculation of orbits, the three-body problem, the dynamical stability of gravitational systems
- ii. Improvements in telescope design and increased accuracy of measurements: the discovery of the aberration of light
- iii. Speculations concerning the origin of the solar system, the nature of nebulae, and the structure of the universe

e. Astronomy in the 19th century

- i. The discovery of Neptune and the asteroids, the search for a planet within the orbit of Mercury
- ii. Improved determinations of stellar positions and magnitudes; the first measurements of stellar parallax; the compilation of catalogs of nebulae, stars, and star clusters
- iii. Development of astronomical spectroscopy and the use of photography in observational work

f. Astronomy in the 20th century

- i. Statistical studies of stars, nebulae, and galaxies
- ii. Theories of stellar structure and of stellar formation and evolution
- iii. Astronomical tests of general relativity: the gravitational red shift, the deflection of light, the precession of the perihelion of Mercury, the cosmological red shift
- iv. Relativistic cosmologies: the big bang model; open and closed models of the universe
- v. Major advances in solar-system astronomy: manned lunar missions; exploration of the planets and their satellites with unmanned space probes; analysis of micrometeoroids and meteorites

- vi. Development of radio, X-ray, infrared, ultraviolet, and gamma-ray astronomy
 - vii. Identification of pulsars, quasars, cosmic background radiation, and possible black holes
 - viii. Advances in instrumentation and methodology: *e.g.*, use of Earth-orbiting observatories; development of electronic radiation detectors; refinement of very long baseline interferometry
2. History of physics
- a. Greek physics: speculations concerning the nature of space, matter, and motion
 - b. Medieval physics: the influence of Aristotle
 - c. Physics in the 16th and 17th centuries: discoveries and theories in mechanics and optics
 - d. Physics in the 18th and 19th centuries
 - i. Development of theories of light: the wave theory versus the corpuscular theory, the search for the ether
 - ii. Development of the theories of electricity, magnetism, and electromagnetic waves
 - iii. Developments in thermodynamics: theories of heat, the laws of thermodynamics, the impossibility of perpetual motion, the kinetic theory of gases
 - iv. Development of the atomic theory of matter: the discovery of the electron, the discovery of radioactivity and X-rays, the discovery of spectral regularities
 - e. Physics in the 20th century
 - i. Development of the theory of relativity
 - ii. Development of the quantum theory, wave mechanics, statistical mechanics, and related theories
 - iii. Development of theories and laws concerning atomic structure, nuclear interactions, and elementary particles, including efforts to produce a unified field theory
 - iv. Development of condensed-matter physics and its contributions to electronics
 - v. Modern developments in physics: atomic beams, nuclear magnetic resonance, and electron spin resonance methods; development of nonlinear optics; the development of masers and lasers
3. History of chemistry
- a. Chemistry before 1700
 - i. The rise of alchemy: the goal of the alchemists—to prolong life and to transmute base metals to gold
 - ii. The influence of the new mechanical philosophy on chemistry: the work of Boyle
 - b. Chemistry in the 18th century
 - i. Studies of combustion and respiration: the phlogiston theory, the work of Lavoisier and Cavendish
 - ii. Laboratory discoveries: isolation and identification of gases; discoveries of new elements, compounds, and chemical reactions
 - c. Chemistry in the 19th century
 - i. Development of the periodic table of the elements: the work of Mendeleyev and Meyer
 - ii. Discoveries of new elements, isotopes, and radioactive elements
 - iii. Development of more accurate methods of analysis
 - iv. Development of theories of molecular structure and chemical reaction
 - v. Development of organic chemistry: introduction of the concept of valence, the study of aromatic compounds, development of the structural theory
 - vi. Development of electrochemistry: the theory of chemical affinity in electrical terms
 - vii. Development of industrial chemistry: the application of chemical principles and reactions to industrial processes

- d. Chemistry in the 20th century
 - i. Development of instrumental methods of chemical analysis
 - ii. Explanation of chemical phenomena by principles of atomic and molecular structures
 - iii. Application of quantum mechanics to chemical bonding
- B. The nature and scope of astronomy and astrophysics: the major subject matters and principal problems
[see also Part One, Division III]
 1. The nature of astronomy and methods of study
 2. Component disciplines of astronomy and their relationship to other sciences: planetary and lunar sciences; meteoritics; the study of comets, minor planets, and the origin of the solar system
 3. Investigation of the scale of the universe and of the distribution of objects within it: the determination of positions, the measurement of distances
 4. Orbit theory: its role in astronomy
 5. Astrophysics: the study of stars, galaxies, and the universe; cosmology and cosmogony
- C. The nature and scope of physics: its major subject matters, methods, and problems
[see also Part One, Divisions I and II]
 1. The nature of physics: its concern with matter and energy and their interactions
 2. Component disciplines of physics: mechanics, thermodynamics, heat, electricity, magnetism, sound, optics, quantum mechanics, states of matter, nuclear and atomic physics
 3. The experimental and theoretical methods of physics
 4. The relationship of physics to other disciplines
 5. Interdisciplinary fields of physics: astrophysics, biophysics, geophysics
 6. Philosophical problems in physics: at the formal level, quantum level, macrophysical level, and cosmological level
- D. The nature and scope of chemistry: its major subject matters and problems
[see also 121, 122, and 123]
 1. The nature of chemistry: its concern with the composition, properties, and changes of matter
 2. The subdivisions of chemistry: analytical, inorganic, organic, physical, polymer, and industrial chemistry and biochemistry
 3. The methods of chemistry
 4. The study of chemical transformations
 5. Interdisciplinary fields of chemistry: geochemistry, chemical engineering, medicinal chemistry

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with the physical sciences

Bohr	Helmholtz	Philosophies of	Physical
Copernicus	Kepler	the Branches of	Sciences, The
Einstein	Lavoisier	Knowledge	Planck
Faraday	Maxwell	Physical Science,	Rutherford
Galileo	Newton	Principles of	
Heisenberg	Pascal		

MICROPAEDIA: Selected entries of reference information

General subjects

<i>major fields and component disciplines:</i>	cosmology	radio and radar	<i>methodology and instrumentation:</i>
aerodynamics	fluid mechanics	astronomy	astronomical
astronomy	infrared astronomy	statistical	observatory
biochemistry	mechanics	mechanics	bubble chamber
celestial mechanics	optics	thermodynamics	centrifuge
chemistry	physics	ultraviolet	chromatography
	quantum	astronomy	cloud chamber
	mechanics		

digital computer
laser
mass spectrometry
microscope
molecular beam

nuclear magnetic
resonance
particle
accelerator
photometry

radio
interferometer
radio telescope
satellite
observatory
sounding rocket

spacecraft
spectrochemical
analysis
star catalog
supercomputer
telescope

Biographies

astronomers:

Ambartsumian,
Viktor
Banneker,
Benjamin
Bessel, Friedrich
Wilhelm
Bradley, James
Brahe, Tycho
Cannon, Annie
Jump
Cassini, Gian
Domenico
Eddington, Sir
Arthur Stanley
Eudoxus of Cnidus
Gamow, George
Halley, Edmund
Herschel, Sir John
Herschel, Sir
William
Hipparchus
Hubble, Edwin
Powell
Kuiper, Gerard
Peter
Laplace,
Pierre-Simon,
marquis de
Le Verrier,
Urbain-Jean-Joseph
Lovell, Sir Bernard
Messier, Charles
Newcomb, Simon
Ptolemy
Russell, Henry
Norris
Schwarzschild, Karl
Struve, Otto

chemists:

Arrhenius, Svante
Berthelot,
Marcellin

Berthollet,
Claude-Louis,
Comte
Berzelius, Jöns
Jacob
Boyle, Robert
Bunsen, Robert
Wilhelm
Cannizzaro,
Stanislao
Cori, Carl; and
Cori, Gerty
Crookes, Sir
William
Curie, Marie
Curie, Pierre
Dalton, John
Davy, Sir
Humphry
Debye, Peter
Gay-Lussac,
Joseph-Louis
Haber, Fritz
Hahn, Otto
Hodgkin, Dorothy
Mary
Joliot-Curie,
Frédéric and
Irène
Kendrew, Sir John
Cowdery
Langmuir, Irving
Lavoisier,
Antoine-Laurent
Libby, Willard F.
Liebig, Justus,
Freiherr von
Mendeleyev,
Dmitry Ivanovich
Mulliken, Robert
Sanderson
Pasteur, Louis

Pauling, Linus
Priestley, Joseph
Ramsay, Sir
William
Sanger, Frederick
Scheele, Carl
Wilhelm
Seaborg, Glenn T.
Soddy, Frederick
Stahl, Georg Ernst
Woodward, R.B.
Wöhler, Friedrich

physicists:

Alvarez, Luis
Walter
Arago, François
Bardeen, John
Becquerel, Henri
Bethe, Hans
Albrecht
Bragg,
Sir Lawrence
Bragg, Sir William
Bridgman, P.W.
Broglie,
Louis-Victor, 7e
duc de
Cavendish, Henry
Dirac, P.A.M.
Fermi, Enrico
Feynman, Richard
P(hillips)
Gell-Mann,
Murray
Gibbs, J. Willard
Henry, Joseph
Hertz, Heinrich
Hooke, Robert
Huygens,
Christiaan
Kapitsa, Pyotr
Leonidovich

Kirchhoff, Gustav
Robert
Landau, Lev
Davidovich
Lee, Tsung-Dao
Lorentz, Hendrik
Antoon
Mach, Ernst
Mayer, Maria
Goeppert
Meitner, Lise
Michelson, A.A.
Mössbauer, Rudolf
Ludwig
Oppenheimer, J.
Robert
Pauli, Wolfgang
Plücker, Julius
Purcell, E.M.
Raman, Sir
Chandrasekhara
Venkata
Rayleigh, John
William Strutt,
3rd Baron
Rutherford, Ernest
Schrödinger, Erwin
Stokes, Sir George
Gabriel
Thompson, Sir
Benjamin
Thomson, Sir
Joseph John
Tomonaga
Shin'ichirō
Yang, Chen
Ning
Young, Thomas
Yukawa Hideki

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Section 10/33. The Earth Sciences

A. The history of the Earth sciences

1. The origins of the Earth sciences in prehistoric times
2. The Earth sciences from antiquity to the 16th century
 - a. Geologic sciences
 - i. Speculations about earthquakes and volcanic eruptions
 - ii. Speculations about fossils
 - iii. Study of landforms and land–sea relations
 - b. Hydrologic and atmospheric sciences
 - i. Theories of groundwater circulation and precipitation
 - ii. The origin of the Nile and the cause of its floods
 - iii. Study of the tides
3. The Earth sciences in the 16th, 17th, and 18th centuries
 - a. Geologic sciences
 - i. The beginnings of mineralogy: the study of ore deposits
 - ii. The development of paleontology and stratigraphy
 - iii. The controversy between the Neptunists and Plutonists: Earth history according to Werner and Hutton
 - b. Hydrologic sciences
 - i. Theories of spring discharge
 - ii. The earliest quantitative investigations of the global water balances
 - c. Atmospheric sciences
 - i. The study of water vapour in the atmosphere
 - ii. The study of atmospheric pressure, temperature, and circulation
4. The Earth sciences in the 19th century
 - a. Geologic sciences
 - i. The development of crystallography and the classification of minerals and rocks
 - ii. The concept of faunal succession and organic evolution: the contributions of William Smith, Charles Darwin, and others
 - iii. The concept of uniformitarianism: contributions of Charles Lyell and others
 - iv. Evidence for an Ice Age: the work of Louis Agassiz
 - v. The concept of geologic time and estimates of the age of the Earth
 - vi. Concepts of landform evolution
 - vii. The study of gravity, isostasy, and the Earth's figure
 - b. Hydrologic sciences
 - i. The study of groundwater flow and surface water discharge: Darcy's law
 - ii. The beginnings of oceanography as a discipline
 - c. Atmospheric sciences
 - i. The study of the composition of the atmosphere
 - ii. The study of clouds, fog, dew, and storms
 - iii. The study of weather and climate: the origin of synoptic meteorology
5. The Earth sciences in the 20th century
 - a. Geologic sciences
 - i. Development of radiometric dating
 - ii. The experimental study of rocks: experimental petrology

- iii. Advances in geophysics: the development of seismology and the study of the internal structure of the Earth
 - iv. Astrogeologic research: the application of the Earth sciences to the investigation of the planets and their satellites
 - v. Advances in paleontology: the development of paleoecology and micropaleontology; the study of Precambrian life
 - vi. The theory of plate tectonics: a unification of the ideas of continental drift and seafloor spreading
 - b. Hydrologic sciences
 - i. The study of water resources and seawater chemistry
 - ii. The exploitation of oceanic resources: desalinization, tidal power, and minerals from the sea
 - iii. The charting of the ocean floors: progress in bathymetry
 - iv. The study of ocean circulation, currents, and waves
 - v. The study of glacier motion and high-latitude ice sheets
 - c. Atmospheric sciences
 - i. The application of modern technology to meteorology: ground-based remote-sensing instruments, orbiting satellites, computer models simulating atmospheric features
 - ii. Advances in weather forecasting and cloud physics
 - iii. The study of the properties and structure of the atmosphere
 - iv. The development of weather modification methods
 - v. The classification of climate
- B. The nature, scope, and methods of the individual Earth sciences**
[see also Part Two]
- 1. Physical geography: the study of the distribution and spatial patterns of soils, water, climate, landforms, and other Earth features
[see also 10/36.F.]
 - 2. The geologic sciences: mineralogy, petrology, economic geology, and geochemistry; geodesy, geophysics, structural geology, and volcanology; geomorphology; glacial geology; engineering, environmental, and urban geology; geochronology, historical geology, paleontology, stratigraphy, and astrogeology
[see also Part Two, Divisions I, III, and IV]
 - 3. The hydrologic sciences: hydrology, limnology, glaciology, oceanography
[see also 222]
 - 4. The atmospheric sciences: meteorology, climatology, aeronomy; the study of the atmospheres of other planets
[see also 221 and 223]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the Earth sciences

Earth Sciences, The
Geography

MICROPAEDIA: Selected entries of reference information

General subjects

<i>component disciplines:</i>	environmental geology	marine geophysics	sedimentology
astrogeology	geochemistry	meteorology	seismology
bioclimatology	geochronology	mineralogy	structural geology
chemical	geology	oceanography	tectonics
hydrology	geomorphology	paleoclimatology	volcanology
climatology	geophysics	paleogeography	<i>methodology and instrumentation:</i>
dendrochronology	hydrology	paleogeology	aerial photography
economic geology	hydrometeorology	palynology	barometer
	marine geology	pedology	bathymetry
		petrology	

bathyscaphe	gravimeter	Richter scale	<i>other:</i>
bathythermograph	magnetometer	seismograph	International
dating	radiosonde	weather map	Geophysical Year
geologic time			

Biographies

Agassiz, Louis	Goldschmidt,	Powell, John	Van Hise, Charles
Agricola, Georgius	Victor Moritz	Wesley	Richard
Bjerknes, Vilhelm	Humboldt,	Press, Frank	Vernadsky,
F.K.	Alexander von	Romer, Alfred	Vladimir
Buch, Leopold,	Hutton, James	Sherwood	Ivanovich
Freiherr von	Köppen, Wladimir	Runcorn, Stanley	Wegener, Alfred
Cuvier, Georges,	Leonardi, Piero	Keith	Lothar
Baron	Lyell, Sir Charles	Simpson, George	Werner, Abraham
Dana, James D.	Maury, Matthew	Gaylord	Gottlob
Ekman, V. Walfrid	Fontaine	Smith, William	
Gilbert,	Mohorovičić,	Suess, Eduard	
Grove Karl	Andrija		

INDEX: See entries under all of the terms above

Section 10/34. The Biological Sciences
A. History of the biological sciences

1. Origin and early development of biological ideas
 - a. Views of life and living things in ancient Eastern and Middle Eastern civilizations
 - b. Biology in the Greco-Roman world: theories about mankind and the origin of life; Aristotelian concepts of classification, reproduction, heredity, and descent; botanical investigations; initial anatomical discoveries
 - c. Biology in the Middle Ages: the influence of Arabian biologists, the development of botany and zoology as separate disciplines, further discoveries in anatomy
 - d. Biology in the Renaissance: the influence of the craft of printing and artists' illustrations on the dissemination of botanical knowledge, the beginning of the scientific study of anatomy through the use of dissection
2. Developments in the biological sciences in the 17th, 18th, and 19th centuries
 - a. Biology in the 17th and 18th centuries
 - i. The discovery of the circulation of blood
 - ii. The establishment of scientific societies
 - iii. The development of the microscope: the classical microscopists
 - iv. The rise of modern taxonomy: the systematic classification of plants and animals
 - v. The emergence of comparative biological studies
 - vi. Experimental approaches to the origin of life: the theory of spontaneous generation
 - b. Biology in the 19th century
 - i. The effect of geographical explorations on the development of the biological sciences
 - ii. The development of cell theory: the establishment of cellular biology
 - iii. The theory of evolution: the impact of the concept of natural selection
 - iv. The rise of embryology: discoveries concerning reproduction and development of organisms
 - v. The emergence of genetics: the study of heredity and its mechanisms
3. Biology in the 20th century
 - a. The establishment of molecular biology
 - i. The one-gene, one-enzyme theory and its effects
 - ii. The discovery of the genetic significance of DNA and RNA: deciphering the genetic code

- b. The emergence of intradisciplinary specialties; *e.g.*, cell physiology, cytochemistry, ecology, population biology
- c. The application to biology of the concepts and techniques of other sciences: the development of biochemistry and biophysics, the importance of biological discoveries to medicine and agriculture

B. The nature, scope, and methodology of the biological sciences

[see also Part Three]

1. Molecular biology: biochemistry, biophysics, genetics
2. Cell biology: cancer research, microbiology, radiation biology, tissue culture, transplantation biology
3. Organismic biology: botany, ecology, embryology, ethology, eugenics, genetics, gnotobiology, morphology, paleontology, physiology, zoology
4. Population biology: biogeography, comparative psychology, ecology, population genetics
5. Taxonomy and methods of classification

C. Philosophy of biology

1. The range of topics in biophilosophy; *e.g.*, old questions investigated anew in the light of biological advances and new standards of philosophical rigour
2. Issues concerning the nature of biological systems
3. Issues concerning evolution
4. Issues with ethical implications

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with the biological sciences

Biological Sciences, The	Harvey
Darwin	Pasteur
Genetics and Heredity, The Principles of	Philosophies of the Branches of Knowledge

MICROPAEDIA: Selected entries of reference information

General subjects

<i>component disciplines:</i>	cytology	microbiology	zoology
agrostology	ecology	molecular biology	<i>methodology and instrumentation:</i>
anatomy	embryology	morphology	centrifuge
bioethics	entomology	ornithology	chromatography
biogeography	ethology	paleontology	electrophoresis
biology	eugenics	palynology	fluoroscope
biophysics	exobiology	parasitology	microscope
biotechnology	genetic engineering	physiology	nuclear magnetic resonance
botany	genetics	protozoology	testcross
comparative anatomy	herpetology	synecology	
	ichthyology	taxonomy	
	mammalogy	teratology	

Biographies

<i>anatomists:</i>	Huxley, Sir Julian	Watson, James	Hoagland, Dennis
Müller, Johannes	Huxley, T.H.	Dewey	Robert
Peter	Lamarck,	<i>botanists:</i>	Hooker, Sir Joseph
Sabin, Florence	Jean-Bapiste	Bentham, George	Dalton
Rena	de Monet,	Brown, Robert	Hooker, Sir
Vesalius, Andreas	Chevalier de	Candolle,	William Jackson
<i>biologists:</i>	Loeb, Jacques	Augustin	Linnaeus, Carolus
Bateson, William	Lysenko, Trofim	Pyrame de	Nägeli, Karl
Carson, Rachel	Denisovich	Cohn, Ferdinand	Wilhelm von
Ehrenberg,	Malpighi, Marcello	Dodge, Bernard	Ray, John
Christian	<i>biophysicists:</i>	Ogilvie	Sprengel, Christian
Gottfried	Crick, Francis	Engler, Adolf	Konrad
Elton, Charles	Harry Compton	Gray, Asa	

Stakman, Elvin	Hérelle, Félix d'	Sherrington, Sir	Geoffroy,
Charles	Merchnikoff, Élie	Charles Scott	Saint-Hilaire,
<i>embryologists:</i>	Waksman, Selman	Spallanzani,	Étienne
Baer, Karl Ernst,	Abraham	Lazzaro	Gesner, Conrad
Ritter von	<i>physiologists:</i>	Starling, Ernest	Leeuwenhoek,
Spemann, Hans	Bayliss, Sir	Henry	Antoine van
<i>geneticists:</i>	William Maddock	<i>zoologists:</i>	Owen, Sir Richard
Beadle, George	Bernard, Claude	Cuvier, Georges,	Swammerdam, Jan
Wells	Einthoven, Willem	Baron	Wallace, Alfred
Dobzhansky,	Galen of	de Beer, Sir Gavin	Russel
Theodosius	Pergamum	Haeckel, Ernst	
Mendel, Gregor	Haller,	Lorenz, Konrad	
Morgan, Thomas	Albrecht von	Rafinesque,	
Hunt	Macleod, J.J.R.	Constantine	
Weismann, August	Müller, Johannes	Samuel	
Wright, Sewall	Peter	<i>other:</i>	
<i>microbiologists:</i>	Pavlov, Ivan	Galton, Sir Francis	
Dubos, René	Petrovich	Galvani, Luigi	

INDEX: See entries under all of the terms above

Section 10/35. Medicine and Affiliated Disciplines

A. History of medicine and surgery

1. Early medicine: Western medicine before 1800, Oriental medicine before c. 1900
 - a. The medicine of prehistoric peoples
 - b. The practice of medicine among the Babylonians, the ancient Egyptians, and the Hebrews
 - c. Medicine and surgery in the Orient: the beginning of systematized medicine
 - i. Medicine in India: the Vedic and Brahmanistic heritage, the influence of religious and magical beliefs, surgical practices
 - ii. Medicine in China: the influence of the cosmic theory of Yin and Yang; the use of herbals, drugs, and acupuncture
 - iii. Medicine in Japan: assimilation of Chinese and European practices
 - d. The beginning of systematic medicine in the Greco-Roman world
 - i. Early influences: mythological beliefs, the investigations and theories of early philosophers
 - ii. The work of Hippocrates: theories on the nature and treatment of disease, the charter of medical conduct
 - iii. The spread of Greek teachings to Rome: the acceptance of Galen as a medical authority
 - e. Medicine from the fall of Rome through the Middle Ages
 - i. Reservoirs of medical learning: the role of medieval monasteries in preserving the medical heritage of Greece and Rome, contributions of Arabian medicine
 - ii. Establishment of the first organized medical school at Salerno
 - f. Medicine in the Renaissance
 - i. Improvements in anatomical theory and surgery
 - ii. The control of medical practice in Britain
 - iii. The work of Paracelsus and Fracastoro
 - g. Medicine in the 17th century
 - i. Discoveries concerning the circulation of the blood: use of the experimental method, importance of the microscope to medical studies
 - ii. The iatrochemical and iatrophysical theories: the view of life as a series of chemical processes versus the view of life as a mechanism governed by physical laws
 - h. Medicine in the 18th century

- i. Genesis of the medical school and the hospital
 - ii. The beginning of medical specialties: emergence of surgery, obstetrics, and pathology as separate disciplines
 - iii. Improvement in techniques of vaccination and in the treatment of disease: the rise and decline of systems of animism and mesmerism
2. The rise of scientific medicine in the 19th century
 - a. New doctrines, laws, and concepts; *e.g.*, the cell and cellular pathology, natural selection, homeostasis, pathogenesis, the Mendelian laws
 - b. Further advances in physiology
 - c. Establishment of bacteriology: verification of the germ theory, the identification of disease-producing organisms, the introduction of antiseptics
 - d. The discovery and use of anesthesia
 - e. Other advances: the discovery of the transmission of disease by insects, initial measures to control typhoid, the discovery of X-rays, the development of the ophthalmoscope and the stethoscope
3. Medicine in the 20th century
 - a. Advances in chemotherapy: the discovery, development, and use of antibiotics and synthetic drugs in the treatment of bacterial diseases
 - b. Advances in immunology
 - i. Improvements in vaccines that control bacterial diseases; *e.g.*, typhoid, diphtheria, tetanus, tuberculosis
 - ii. The introduction and use of vaccines to control viral diseases; *e.g.*, yellow fever, influenza, poliomyelitis, measles
 - c. Developments in endocrinology: the discovery of insulin and the control of diabetes, the use of cortisone as an anti-inflammatory agent, the study and use of sex hormones
 - d. Advances in other fields
 - i. Nutrition: the treatment of deficiency diseases through the discovery and identification of vitamins
 - ii. Cancer research: the treatment of abnormal cell growths through the application of various therapies
 - iii. Tropical medicine: the treatment of yellow fever, malaria, and leprosy through the discovery and application of synthetic organic compounds derived from quinine and other sources; the application of insecticides to control malaria and yellow fever
 - iv. Medical technology and biomedical instrumentation: the use of electronic devices to monitor physiological processes, to conduct automatic laboratory analyses, and to perform other diagnostic and therapeutic procedures
4. Surgery in the 20th century
 - a. The state of surgery prior to 1900: the importance of antisepsis, asepsis, and anesthesia to the development of modern surgery
 - b. The emergence of surgical specialties: the development of new surgical and diagnostic techniques
 - c. Improvements in the treatment of wounds; *e.g.*, the development of plastic surgery, postsurgical rehabilitation
 - d. The use of blood transfusions and other intravenous techniques to reduce shock, treat fluid loss, and restore electrolyte balance
 - e. The introduction of inhalation anesthetic procedures; *e.g.*, improvements in thoracic surgery
- B. Fields of specialized medical practice or research
 1. Hospital residency specialties
 - a. Radiology
 - b. Surgery
[see also 423.C.2.a.]
 - c. Obstetrics and gynecology
[see also 423.F.6.]

- d. Urology
[see also 423.F.7.]
- e. Ophthalmology and otolaryngology
[see also 423.F.9.f. and g.]
- f. Neurology
[see also 423.F.9.]
- g. Psychiatry
- h. Other hospital specialties; *e.g.*, anesthesiology, pathology
- 2. Other clinical specialties
 - a. Aerospace medicine
 - b. Medical jurisprudence
 - c. Occupational medicine
 - d. Public health
 - e. Endocrinology
 - f. Immunology
 - g. Toxicology
 - h. Tropical medicine
- 3. Nonclinical specialties and the basic medical sciences: medical physiology and pathological physiology, nutrition, pharmacology and experimental therapeutics, gerontology
- 4. Ancillary medical disciplines: cytotechnology, medical records, medical technology, X-ray technology
- C. Disciplines affiliated with medicine
 - 1. History and practice of dentistry
 - 2. History and practice of osteopathy
 - 3. History and practice of nursing
 - 4. History and practice of pharmacy

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major article dealing with medicine and affiliated disciplines

Medicine

MICROPAEDIA: Selected entries of reference information

General subjects

aerospace medicine	gerontology and	ophthalmology	plastic surgery
anesthesiology	geriatrics	oral surgery	podiatry
cardiology	hematology	orthodontics	prosthodontics
dentistry	holistic medicine	orthopedics	psychiatry
dermatology	homeopathy	osteopathy	public health
emergency	immunology	otolaryngology	radiology
medicine	internal medicine	pathology	sports medicine
endocrinology	nephrology	pediatrics	surgery
endodontics	neurology	pedodontics	toxicology
epidemiology	nursing	peridontics	tropical medicine
family practice	obstetrics and	pharmacology	urology
forensic medicine	gynecology	pharmacy	
gastroenterology			

Biographies

Alexander, Franz	Blackwell,	Ehrlich, Paul	Gesell, Arnold
Avicenna	Elizabeth	Fleming, Sir	Harvey, William
Barnard,	Blalock, Alfred	Alexander	Hippocrates
Christiaan	Carrel, Alexis	Fracastoro,	Jenner, Edward
Barnard, Claude	Cohn, Ferdinand	Girolamo	Jung, Carl
Bekhterev,	De Bakey, Michael	Freud, Sigmund	Koch, Robert
Vladimir	Ellis	Galvani, Luigi	

Lister, Joseph
 Malpighi, Marcello
 Mayo family
 Menninger family
 Meyer, Adolf

Nightingale,
 Florence
 Osler, Sir William
 Paracelsus
 Reed, Walter

Rush, Benjamin
 Salk, Jonas
 Edward
 Séguin, Edouard

Semmelweis, Ignaz
 Philipp
 Vesalius, Andreas
 Virchow, Rudolf

INDEX: See entries under all of the terms above

Section 10/36. The Social Sciences and Psychology and Linguistics

A. History of the social sciences

1. Origins of the social sciences

- a. Precursors of the social sciences in the Middle Ages and the Renaissance
- b. Heritage of the Enlightenment: social reforms and revolution

2. 19th-century developments in the social sciences

- a. The influence of new concepts in social, political, economic, and scientific theories
- b. Development of the separate disciplines; *e.g.*, economics, political science, anthropology, sociology, social statistics, human geography

3. 20th-century developments in the social sciences

- a. The influence of social upheaval in the non-Western world: the revolution of rising expectations
- b. The influence of Marxism
- c. The influence of Freudian ideas
- d. The changing character of the disciplines
 - i. Specialization and cross-disciplinary approaches
 - ii. The increasing professionalism of social scientists as consultants and decision makers in government and business
 - iii. The introduction of mathematical and other quantitative methods: the use of computers
 - iv. The influence of empiricism: the collection of data, the use of surveys and polls, the testing of theories
- e. Major theoretical influences: developmentalism, the social-systems approach, structuralism and functionalism

B. The nature of anthropology

[see also Part Five, Division I]

1. The background of anthropology
2. The scope and methods of anthropology: the division between cultural and physical anthropology

C. The nature of sociology

[see also Part Five, Division II]

1. The background of contemporary sociology
2. The methodology of contemporary sociology
3. The status of contemporary sociology
4. Emergent trends in sociology
5. Cognate disciplines: criminology, penology, social psychology, demography

D. The nature of economics

[see also Part Five, Division III]

1. Development of theories of economics
2. The scope and methods of the study of economics: microeconomics, macroeconomics
3. Cognate disciplines: mathematical economics, econometrics, accounting

E. The nature of political science

[see also Part Five, Division IV]

1. The history of political science
2. The scope and methods of contemporary political science
3. Cognate disciplines: the study of public opinion, public law, public administration, political systems, and international relations

F. The nature of geography

[see also 10/33]

1. The history of geography
2. The scope and methods of geography: the division between physical, human, and regional geography

G. History and methods of psychology

[see also Part Four, Division III]

1. The history of psychology
2. The nature and scope of psychology
3. Special branches and cognate disciplines of psychology: physiological psychology, social psychology

H. The nature of linguistics

[see also 514]

1. The history of linguistics
2. The nature and scope of linguistics
3. Linguistics and other disciplines: psycholinguistics, sociolinguistics, linguistic anthropology, linguistic geography, computational linguistics, mathematical and statistical linguistics, stylistics, and semantics

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with the social sciences and psychology and linguistics

Freud	Marxism, Marx and
Geography	Smith, Adam
Linguistics	Social Sciences, The

MICROPAEDIA: Selected entries of reference information

General subjects

<i>anthropology and allied disciplines:</i>	institutional	semiotics	experimental
anthropological	economics	sociolinguistics	psychology
linguistics	Keynesian	structural	functionalism
cultural	economics	linguistics	Gestalt psychology
anthropology	macroeconomics	synchronic	humanistic
ethnography	managerial	linguistics	psychology
neoevolutionism	economics	<i>political science:</i>	individual
particularism	welfare economics	geopolitics	psychology
physical	<i>linguistics:</i>	political science	industrial
anthropology	anthropological	<i>psychology:</i>	psychology
structuralism	linguistics	analytic	physiological
<i>economics:</i>	comparative	psychology	psychology
Austrian school of	linguistics	applied psychology	psychology
economics	computational	behaviourism	social psychology
classical economics	linguistics	clinical psychology	<i>other:</i>
econometrics	dialectology	comparative	criminology
economics	ethnolinguistics	psychology	demography
historical school of	historical	developmental	geography
economics	linguistics	psychology	penology
	linguistics	educational	sociology
	neurolinguistics	psychology	

Biographies*anthropologists:*

Benedict, Ruth
 Boas, Franz
 Dart, Raymond A.
 Frazer, Sir James
 George
 Hale, Horatio
 Kroeber, A.L.
 Leakey, L.S.B.
 Leakey, Richard
 Lévi-Strauss,
 Claude
 Malinowski,
 Bronisław
 Mead, Margaret
 Morgan, Lewis
 Henry
 Radin, Paul
 Redfield, Robert
 Sapir, Edward
 Seligman, C.G.
 Thurnwald,
 Richard
 Tozzer, Alfred M.
 Tylor, Sir Edward
 Burnett

economists:

Bagehot, Walter
 Bentham, Jeremy
 Enfantin,
 Barthélemy-Prospér
 Keynes, John
 Maynard
 Lauderdale, James
 Maitland, 8th
 earl of

Malthus, Thomas
 Robert
 Marshall, Alfred
 Marx, Karl
 Myrdal,
 Gunnar
 Oresme, Nicholas
 Pareto, Vilfredo
 Ricardo, David
 Samuelson, Paul
 Simonde de
 Sismondi, J.C.L.
 Tawney, Richard
 Henry
 Veblen, Thorstein

geographers:

Davis, William
 Morris
 Hettner, Alfred
 Humboldt,
 Alexander von
 Idrisi, ash-Sharif al-
 Mackinder, Sir
 Halford John
 Marsh, George
 Perkins
 Mercator, Gerardus
 Ptolemy
 Ratzel, Friedrich
 Richthofen,
 Ferdinand
 Paul Wilhelm,
 Freiherr von
 Ritter, Carl
 Strabo

Varenius,
 Bernhardus
 Vidal de La
 Blache, Paul

linguists:

Chomsky, Noam
 Jakobson, Roman
 Jespersen, Otto
 Kimhi, David
 Lomonosov,
 Mikhail
 Vasilyevich
 Rask, Rasmus
 Saussure,
 Ferdinand de
 Schleicher, August

psychologists:

Bleuler, Eugen
 Bruner, Jerome S.
 Cattell, James
 McKeen
 Fechner, Gustav
 Theodor
 Fromm, Erich
 Hall, G. Stanley
 Hull, Clark L.
 James, William
 Köhler, Wolfgang
 Kraepelin, Emil
 Kretschmer, Ernst
 McDougall,
 William
 Menninger family
 Meyer, Adolf
 Piaget, Jean
 Rank, Otto

Skinner, B.F.
 Thorndike,
 Edward L.
 Thurstone, L.L.
 Watson, John B.
 Wertheimer, Max

sociologists:

Beccaria, Cesare
 Comte, Auguste
 Cooley, Charles
 Horton
 Durkheim, Émile
 Frazier,
 E. Franklin
 Geiger, Theodor
 Julius
 Lazarsfeld, Paul
 Felix
 MacIver, Robert
 Morrison
 Mauss, Marcel
 Merton, Robert K.
 Mumford, Lewis
 Parsons, Talcott
 Ratzenhofer,
 Gustav
 Riesman, David
 Spencer, Herbert
 Tönnies,
 Ferdinand
 Weber, Max

INDEX: See entries under all of the terms above

Section 10/37. The Technological Sciences
A. History of the technological sciences

[see also Part Seven]

B. Nature and scope of engineering

1. Engineering as a profession: education and training; functions of the engineer; professional associations
2. Branches of engineering: civil engineering, aeronautical engineering, chemical engineering, electrical and electronics engineering, mechanical engineering, optical engineering, nuclear engineering

C. The nature and scope of agricultural sciences

1. History of the agricultural sciences

[see also 731.A.]

2. Subdivisions of the agricultural sciences: soil science, plant production, animal production, agricultural economics and management, agricultural engineering

[see also 731.B., C., and D.]

D. The nature and scope of recently developed interscience disciplines

1. Bionics

- a. Mimicry of nature as the basis for bionics; *e.g.*, the human brain as the paradigm for computer memory devices, construction of vehicles with articulated legs
- b. The use of natural models to understand and solve engineering problems; *e.g.*, natural neural networks as models for electronic circuits, the human brain as a model for computers and information-processing devices
2. Systems engineering and operations research
[see 712.B.]
3. Cybernetics, control theory, and information science
[see 10/23.E. and F.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with the technological sciences

Engineering
Materials Science

Optics, Principles of

MICROPAEDIA: Selected entries of reference information

General subjects

aerospace
engineering
bioengineering
bionics
chemical engineering

civil engineering
electrical and
electronics
engineering

industrial
engineering
materials science
mechanical
engineering

nuclear
engineering
petroleum
engineering

Biographies

Beach, Alfred Ely
Brunel, Isambard
Kingdom
Brunel, Sir Marc
Isambard
Burbank, Luther
Carver, George
Washington

Deming, W. Edwards
Eads, James B.
Eckert, J. Presper, Jr.
Edison, Thomas Alva
Hollerith, Herman
McCormick,
Cyrus Hall
Mauchly, John W.

Pierce, George
Washington
Roebbling, John
Augustus
Sikorsky, Igor
Stakman, Elvin
Charles

Steinmetz, Charles
Proteus
Taylor,
Frederick W.
Tsiolkovsky,
Konstantin
Eduardovich
Whitney, Eli

INDEX: See entries under all of the terms above

Division IV. History and the Humanities

[For Part Ten headnote see page 479.]

The outlines in the two sections of Division IV deal with historiography and the study of history, and with the humanities and humanistic scholarship.

Section 10/41 first treats the history of historical writing in the major cultures of both East and West, and the disciplines and methods involved in modern historical investigation and research. It then treats the speculative philosophies of history that have appeared in the West and the East, and philosophical analyses of the specific character of historical knowledge.

Section 10/42 first sets forth a historical review of changing conceptions of the humanities and of humanistic scholarship, covering all the major periods and mutations, from the Greek ideal of *paideia* to contemporary developments. It then treats issues about the nature and scope of the humanities; about the relation of the component disciplines to one another; and about their distinction from the sciences, their validity as ways of knowing, and their role in education.

Section 10/41. Historiography and the Study of History 509

10/42. The Humanities and Humanistic Scholarship 511

Section 10/41. Historiography and the Study of History

A. Historiography: the types of historical writing

1. Development of historiography: the history of historical writing

a. In the ancient world

i. Near Eastern historiography

- ii. Classical historiography: Greek and Roman
 - iii. Early Christian historiography
 - b. In the Middle Ages
 - i. Western Christian historiography
 - ii. Byzantine historiography
 - c. From the Renaissance to the present
 - i. Renaissance historiography
 - ii. Early modern historiography
 - iii. Enlightenment historiography: the 18th century
 - iv. 19th- and 20th-century historiography
 - d. Non-Western historiographical traditions
 - i. Islāmic historiography
 - ii. East Asian historiography
 - 2. Types of historical writing: diverse ways of distinguishing or classifying kinds of historical writing by method or function
 - 3. Factors involved in the writing of history: the background of the author and his vantage point, method of work, and purpose
- B. Modern historical investigation and research: sources and methods
- 1. Sources for historical writing: material remains, written materials, folklore, place-names
 - 2. Auxiliary disciplines for ascertaining and interpreting the sources
 - a. Anthropology
 - b. Archaeology
 - c. Bibliography
 - d. Chronology
 - e. Dendrochronology
 - f. Diplomatics
 - g. Epigraphy
 - h. Genealogy
 - i. Geography
 - j. Heraldry
 - k. Iconography and iconology
 - l. Linguistics
 - m. Paleography
 - n. Psychoanalysis
 - o. Radiometric dating
 - p. Sigillography
 - q. Textual criticism
- C. Philosophy of history: speculations about the historical process, philosophical analysis of the writing of histories
- 1. Conceptions of the philosophy of history
 - 2. Speculative philosophy of history: diverse explanations of the pattern of historical events
 - 3. Critical or analytical philosophy of history: the analysis of history as a discipline

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with historiography and the study of history

History. The Study of

Philosophies of the Branches of Knowledge

MICROPAEDIA: Selected entries of reference information

General subjects

archaeology
bibliography
diplomatics
epigraphy

genealogy
historical
geography
historiography

history
iconography
linguistics
paleography

papyrology
sigillography
textual criticism

Biographies

archaeologists:

Bingham, Hiram
Blegen, Carl
Botta, Paul-Émile
Boucher de
Perthes, Jacques
Carter, Howard
Evans, Sir Arthur
Garstang, John
Layard, Sir Austen
Henry
Mariette, Auguste
Petrie, Sir Flinders
Pitt-Rivers,
Augustus Henry
Lane-Fox
Rassam, Hormuzd
Schliemann,
Heinrich
Squier, E.G.
Stein, Sir Aurel
Stephens, John
Lloyd
Thompson,
Edward Herbert
Thomsen,
Christian
Jürgensen
Wheeler, Sir
Mortimer
Winckler, Hugo
Woolley, Sir
Leonard
Worsaae, Jens
Jacob Asmussen

historians:

Acton, John
Emerich Edward
Dalberg Acton,
1st Baron

Arai Hakuseki
Aulard,
François-Alphonse
Bancroft, George
Barros Arana,
Diego
Beard, Charles A.
Becker, Carl
Bede the
Venerable, Saint
Biondo, Flavio
Bloch, Marc
Léopold
Benjamin
Braudel, Fernand
Burckhardt, Jacob
Bury, J.B.
Clarendon, Edward
Hyde, 1st earl of
Droysen, Johann
Gustav
Froude, James
Anthony
Fustel de
Coulanges, Numa
Denis
Geoffrey of
Monmouth
Geyl, Pieter
Gibbon, Edward
Giovanni da Pian
del Carpi
Guicciardini,
Francesco
Halévy, Élie
Haskins, Charles
Homer
Herodotus
Huizinga, Johan
Ibn Khaldūn
Jien

Klyuchevsky,
Vasily Osipovich
Lamprecht, Karl
Gottfried
Liutprand of
Cremona
Livy
Ma Tuan-lin
Macaulay, Thomas
Babington
Macaulay, Baron
McMaster, John
Bach
Mas'ūdī, al-
Meinecke,
Friedrich
Michelet, Jules
Mommsen,
Theodor
Namier, Sir Lewis
Bernstein
Niebuhr, Barthold
Georg
Pan Ku
Parkman, Francis
Pasquier, Étienne
Pirenne, Henri
Polybius
Prescott,
William H.
Procopius
Ranke,
Leopold von
Robinson, James
Harvey
Rostovtzeff,
Michael
Ivanovich

Sallust
Sarkar, Sir
Jadunath
Schlesinger,
Arthur M.
Solovyov, Sergey
Mikhaylovich
Ssu-ma Ch'ien
Ssu-ma Kuang
Ṭabarī, aṭ-
Tacitus
Tawney, Richard
Henry
Thierry, Augustin
Thou,
Jacques-Auguste de
Thucydides
Tocqueville,
Alexis de
Toynbee, Arnold
Trevelyan, G.M.
Turner, Frederick
Jackson
Tyler, Moses Coit
Woodson,
Carter G.
other:
Champollion,
Jean-François
Rawlinson, Sir
Henry Creswicke
Sayce, Archibald
Ventris, Michael

INDEX: See entries under all of the terms above

Section 10/42. The Humanities and Humanistic Scholarship

A. History of humanistic scholarship

1. The beginnings of learning: the ideal of *paideia*
 - a. Homeric education: the ideal of the hero
 - b. The Sophists and Socrates: the turn to *logos*, the beginnings of rhetoric
 - c. Plato and the Academy: the relation of theology to mythology, mathematics in the service of philosophy

- d. Aristotle and the Lyceum: the invention of logic, the division and organization of the sciences
- e. Hellenistic scholarship: the development of literary and textual criticism, Alexandria and Pergamum as cultural centres
- f. The Roman ideal of *humanitas*: the training of the orator
- g. The conflict of cultural ideals: the battle among rhetoric, philosophy, and science
2. Christian learning in antiquity and the Middle Ages
 - a. The Christianization of pagan culture: the reconciliation of classical humanism with Christian revelation
 - b. The codification of the liberal arts: the trivium and the quadrivium
 - c. The founding of the universities
 - d. The Scholastic method: logic and the genres of theological exposition
 - e. Faith and reason: the distinction of philosophy from sacred theology
3. The development of humane letters from the Renaissance to the present
 - a. The idea of Renaissance: the ideal of the classical, the rise of the vernacular, the concept of the dignity of the free individual
 - b. Humanism and the new learning
 - c. The search for a universal method
 - d. The separation of science from philosophy: the rise and development of empirical science
 - e. The quarrel between ancients and moderns: the problem of progress in learning
 - f. The growth of modern humanistic scholarship: the transition from the ideal of *belles lettres* to the scientific investigation of antiquity through archaeology and philology
 - g. The rise and development of the liberal arts college and the graduate school
[see 562.B.]
 - h. The growth and proliferation of special disciplines: the knowledge explosion
 - i. The organization of the contemporary university: questions of its social responsibility, the profession of learning
[see 561.C.1.c.]
4. The Jewish tradition of humanistic scholarship: its nature, methods, and development; its relation to classical and Christian learning
5. The Islāmic tradition of humanistic scholarship: its nature, methods, and development; its relation to classical and Christian learning
6. The humanities and humanistic scholarship in the East: in India, in China, in Japan
- B. The humanities
 1. Diverse views of the definition and scope of the humanities
 2. The humanities as an educational program: the question of the humanities as a unified field of study
 3. Theories of the humanities as a fundamental division of knowledge: the question of the distinction of the humanities from the sciences
 4. Problems about the humanities

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with the humanities and humanistic scholarship

Bacon, Francis
Erasmus

Humanism
Scholarship, Classical

MICROPAEDIA: Selected entries of reference information

General subjects

humanism
humanities

paideia
reason

Renaissance
Renaissance man

scholasticism

Biographies

Adams, Henry	Casaubon, Isaac	Lefèvre d'Étaples,	Scaliger, Julius
Alberti, Leon	Estienne, Henri II	Jacques	Caesar
Battista	George of	Melanchthon,	Taine, Hippolyte
Alcuin	Trebizond	Philipp	Valla, Lorenzo
Bentley, Richard			Wang Wei

INDEX: See entries under all of the terms above

Division V. Philosophy

[For Part Ten headnote see page 479.]

The outlines in the three sections of Division V treat the history of philosophy; the nature and the divisions of philosophy; and philosophical schools and doctrines.

The outline in Section 10/51 presents a synoptic history of philosophy. After treating the history of Western philosophy and of non-Western philosophies, the outline indicates other sections that treat philosophies associated with religions.

Section 10/52 first deals with theories about philosophy as a whole: theories about its nature, scope, methods, forms of exposition, and about the criteria of meaning and truth in philosophical thought. It then treats the traditional component disciplines of philosophy: metaphysics, the philosophy of nature, epistemology, the philosophy of mind, the philosophy of mankind, ethics, political philosophy, and aesthetics. In the case of each of these eight disciplines, the outline treats its historical development; its nature and scope; its relations to other branches of philosophy and other intellectual disciplines; and its principal problems. At the end, the outline of this section indicates other sections that treat disciplines involving philosophical studies of other subjects: language, logic, mathematics, art, science, religion, law, education, and history.

Section 10/53 begins by listing 25 major philosophical schools in the West. The section then deals with doctrinal differences between these schools on major philosophical issues, treating differences in theories about Being and existence; about thought, knowledge, and the faculties of the mind; and about human conduct.

Section 10/51. History of Philosophy	513
10/52. The Nature and the Divisions of Philosophy	517
10/53. Philosophical Schools and Doctrines	520

Section 10/51. History of Philosophy**A. History of Western philosophy****1. Ancient Greek and Roman philosophy****a. The beginnings of philosophy in Greece: the Pre-Socratic philosophers**

- i. Cosmology and the metaphysics of matter: theories of the origin and nature of the physical world, monistic and pluralistic cosmologies
- ii. The rise of problems in the theory of knowledge: problems about the real and phenomenal worlds
- iii. The metaphysics of number: Pythagorean speculations about number and the nature of reality, advances toward the foundation of quantitative science
- iv. Anthropology and relativism: the Sophists' criticism of cosmological and metaphysical speculations, man as the measure of all things, the positions of the Sophists about the conventionality of law and justice

b. The maturity of Greek philosophy

- i. The ethical concerns and positions of Socrates: the Socratic method of teaching, the influence of Socrates
- ii. The philosophy of Plato: his dialogues on issues in politics, ethics, metaphysics, epistemology, and cosmology; his emphasis on the relations of mathematics to philosophy
- iii. The philosophy of Aristotle: his criticisms of Platonic metaphysics and theory of knowledge; the corpus of his works on logic; his teleological positions in biology, ethics, and politics; his empirical researches in the natural sciences and on laws and political institutions

- c. Hellenistic and Roman philosophy: developments from the time of Alexander III the Great to the closing of the philosophical schools in Athens
 - i. The philosophy of the Stoics: the teaching of Zeno of Citium concerning the basis of human happiness, the further elaboration of Stoic thought by Cleanthes and Chrysippus, the role of Stoicism during the late Roman Republic and the empire
 - ii. The philosophy of the Epicureans: the teaching of Epicurus concerning the universe, the role of pleasure, and man's relationship to the gods
 - iii. The philosophy of the Skeptics: the teaching of Pyrrhon of Elis concerning man's lack of certainty in knowing, the role of the Skeptics in preserving the doctrines of ancient philosophers
 - iv. The philosophy of the Neo-Pythagoreans and of the Neoplatonists: the teaching of Plotinus concerning the various levels of being, Neo-Pythagorean schools in Asia Minor
 - v. Jewish and Christian philosophy during the Hellenistic Age: diverse attempts to relate the teachings of the Hellenistic and Roman schools to Jewish and Christian theology
2. Philosophy in the Middle Ages
 - a. Early medieval philosophy
 - i. The patristic period: Augustine's use of Neoplatonist thought in his theology and his doctrine of man, the role of Boethius' translations and commentaries, Anselm's proofs of the existence of God, the methodology of Abelard
 - ii. Philosophy and the liberal arts in the schools of the Christian West from the 9th to the 11th century
 - b. The contribution of Arabic and Jewish philosophy: the role of the Islāmic philosophers in increasing the influence of Aristotle in the West, the teaching of Solomon ibn Gabirol and Maimonides
 - c. The age of the Schoolmen: the attempt to reconcile philosophy and theology, the teaching of Bonaventure and Albertus Magnus, Thomas Aquinas' synthesis of Aristotelianism and Christian theology
 - d. Philosophy in the late Middle Ages: new styles of philosophy and theology that vied with Thomism, the criticism of Aristotelian thought by Duns Scotus and Ockham, the speculative mysticism of Eckehart, Nicholas of Cusa's doctrine of the "coincidence of opposites"
3. Modern philosophy
 - a. Philosophy in the Renaissance
 - i. Political theory: the views of Machiavelli, Bodin, Hobbes, Grotius, and others on the nature and moral status of political power
 - ii. Humanism: the influence of the writings of Plato on moral theory and literary endeavour; renewed interest in Atomistic Materialism, ancient Skepticism, and Stoicism
[for humanistic scholarship in the Renaissance, see also 10/42.A.3.]
 - iii. Philosophy of nature: the pluralistic, machinelike, and mathematically ordered character ascribed to the natural world; the influence of discoveries in anatomy, physics, and astronomy on philosophy
 - b. The early modern period: the rise of Empiricism and Rationalism
 - i. Developments in the Empiricist tradition: Bacon's attempt to formulate a new scientific method, Hobbes's theory of knowledge
 - ii. Developments in the Rationalist tradition: the antiempirical character of Descartes's metaphysics and the dualism of his doctrine of man and the world, the speculative systems of philosophy provided by the writings of Spinoza and Leibniz
 - c. Philosophy in the period of the Enlightenment, or the Age of Reason
 - i. Epistemological issues: the attempt of Locke and Berkeley to inquire into the origin and nature of reason, Hume's science of man, Kant's critical examination of reason
 - ii. Developments in the philosophy of science: Materialist views, the effect of scientific discoveries on philosophical thought
 - iii. Social and political philosophy: the concern of Locke and Rousseau with the freedom and equality of citizens, developments in religious philosophy
 - d. Philosophy in the 19th century

- i. The resurgence of the metaphysical spirit: the Idealism of Fichte, Schelling, and Hegel
- ii. Developments in the empirical and scientific tradition: Comte's Positivism and its subsequent influence on the philosophy of science, J.S. Mill's theory of knowledge and ethics, the dialectical Materialism of Marx and Engels
- iii. The reaction against Rationalism: Kierkegaard's preoccupation with the states of consciousness, Schopenhauer's doctrine of cosmic will, the writings of Nietzsche
- e. Philosophy in the 20th century
 - i. Independent speculative and social philosophies: Bergson's intuitionism, Whitehead's speculative philosophy, William James's and Dewey's Pragmatism
 - ii. Developments in Marxist thought: Lenin's metaphysical Materialism and his theory of knowledge, the continuing attempt to make theory serve practice

B. Non-Western philosophy

1. Indian philosophy

- a. Early Indian philosophical thought: the role of Hindu and Buddhist sacred literature in presystematic philosophy, the concepts of Brahman and *ātman* in Hindu thought and of selflessness and Nirvāṇa in early Buddhist writings
- b. The beginning of system building in Indian philosophy: the role of the *sūtra*, metaphysical and epistemological concerns, ethical and political thought, the teaching of the Ājīvikas and Cārvākas
- c. The further developments of systematic thought in India: Realism and Idealism in metaphysical and epistemological thought, the relation of pluralistic and monistic views to various linguistic philosophies
- d. The schools of Vedānta: the contribution of Śaṅkara and Rāmānuja and their followers; the schools of Nimbārka, Vallabha, and Caitanya
- e. The Vaiṣṇava and Śaiva schools: philosophical systems based on the literature of Vaiṣṇavism and Śaivism
- f. Later Indian philosophical thought: the influence of Islāmic thought and European philosophy, recent trends

2. Chinese philosophy

- a. The classical Chinese philosophical schools; *e.g.*, Confucianism, Taoism, Yin-Yang, Mohism, Dialecticians, the Legalist school
- b. Neo-Taoist and Buddhist thought
- c. Neo-Confucianism: the development of the concept of principle
- d. 20th-century Chinese philosophy: the effects of Western thought and of Maoism

3. Japanese philosophy

- a. Early Japanese philosophical thought: the introduction of Buddhism and Confucianism, the Six Schools of Nara, Tendai and Shingon philosophy
- b. Developments during the Kamakura and Muromachi periods: the origins and concerns of the Zen, Jōdo (Pure Land), and Nichiren sects; tendencies in Shintō and Confucian thought

C. Philosophies associated with religion

- 1. Hindu philosophy
[see 823.B.3.]
- 2. Buddhist philosophy
[see 824.B.3.]
- 3. Confucian philosophy
[see 825.B.3.]
- 4. Taoist philosophy
[see 825.C.3.]
- 5. Jewish philosophy
[see 826.B.6.]
- 6. Islāmic philosophy
[see 828.B.4.]
- 7. Christian philosophy
[see 827.E.7.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with the history of philosophy

Aristotelianism, Aristotle and Augustine Cartesianism, Descartes and Christianity Confucianism, Confucius and	Hegelianism, Hegel and Hume Indian Philosophy Kantianism, Kant and Locke Marxism, Marx and	Mill, John Stuart Nietzsche Philosophy, The History of Western Platonism, Plato and Rousseau, Jean-Jacques	Smith, Adam Socrates Taoism Thomism, Thomas Aquinas and
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MICROPAEDIA: Selected entries of reference information

General subjects

<i>Arabic philosophy:</i>	entelechy	kuṇḍālini	Zen
Ahl al-Kitāb	epochē	Mādhyamika	<i>medieval Western</i>
Bāṭiniyah	first cause	māyā	<i>philosophy:</i>
Dahriyah	form	Mimamsa	fideism
faḍl	hylomorphism	nirguṇa	intention
ghaybah	logos	Nyāya	Ockham's razor
ikhtilāf	microcosm	pāramitā	Scholasticism
kalām	Not-Being,	prajñāpti	tabula rasa
kasb	denial of	prakṛiti	<i>modern Western</i>
Māturidiyah	opposites, table of	pramāṇa	<i>philosophy:</i>
Murji'ah	paradoxes of Zeno	prana	a priori knowledge
Mu'tazilah	sensationalism	prāṇāyāma	antinomy
Qadariyah	virtue,	pratītya-samutpāda	as if, philosophy of
Rāfiḍah	teachability of	pratyakṣa	axiology
rahbāniyah	<i>Indian philosophy:</i>	pratyaya	categorical
rajm	Abhidharmakośa	purusha	imperative
Sālimīyah	abhijñā	śabda	cogito, ergo sum
shirk	Advaita	Śaiva-siddhānta	common sense,
tahajjud	ahankara	samadhi	philosophy of
talbiyah	ajiva	Sāṃkhya	concept
taqiya	Ājīvika	samsāra	constitution theory
tashbih	akriyāvāda	saṃvṛti-satya	deconstruction
tawḥīd	ālaya-vijñāna	skandha	deontological
ziyārah	ānanda	smṛtyupasthāna	ethics
<i>Chinese philosophy:</i>	anumāna	syādvāda	deus otiosus
ch'i	Artha-śāstra	tat tvam asi	dialectical
Chinese	asana	trīsvabhāva	materialism
philosophy	asrāva	upādhi	eudaemonism
hsien	āstika	Vaisheshika	good-reason theory
hsu	ātman	Vedānta	humanism
jen	bhedābheda	Viśiṣṭādvaita	ideal language
Legalism	brahma	yama	identity theory
Mohism	brahmavihāra	Yoga	innate idea
p'u	cakra	Yogācāra	interactionism
T'ai Chi	Cārvāka	<i>Japanese philosophy:</i>	irrationalism
tao	dravya	Japanese	I-Thou
te	Dvaita	philosophy	leap of faith
T'ien Ming	Haṭha Yoga	Jōjitsu	mathematicism
tzu-jan	Indian philosophy	Kegon	metaethics
wu-wei	indriya	Nichiren	metalanguage
yin-yang	jiva	Buddhism	methodic doubt
<i>Greek philosophy:</i>	jnana	Pure Land	mind-body dualism
apathy	kammaṭṭhāna	Buddhism	monad
cosmopolitanism	karma	Ritsu	natural law
emanationism	Kashmir Śaivism	Shingon	normative ethics

noumenon	protocol sentence	social contract	theodicy
occasionalism	radical empiricism	solipsism	transcendental
panpsychism	reductionism	superman	idealism
phenomenalism	revisionism	synthesis	unified science
phenomenon	secularism	teleological ethics	

Biographies

Anaximenes of Miletus	Inoue Tetsujirō	Maimonides, Moses	Spinoza, Benedict de
Averroës	Israeli, Isaac ben Solomon	Nārājunga	
Avicenna	Justin Martyr, Saint	Nishida Kitarō	
Buber, Martin	Lao-tzu	Schopenhauer, Arthur	
Chuang-tzu			

See also Sections 10/52 and 10/53

INDEX: See entries under all of the terms above

Section 10/52. The Nature and the Divisions of Philosophy

- A. The nature, scope, and methods of philosophy
[for the major philosophical schools in the West, see 10/53; for the development of non-Western philosophy, see 10/51.B.]
 1. Diverse conceptions of philosophy
 2. Diverse views of the methods of philosophy
 3. The forms of philosophical exposition; *e.g.*, dialogues, commentaries, histories, systematically ordered treatises
 4. Criteria of meaning and truth in philosophical thought
- B. The divisions of philosophy
 1. Metaphysics, or speculative philosophy in general
 - a. The history, nature, and scope of metaphysics
[for schools of thought in metaphysics, see 10/53.B.1.]
 - b. The relation of metaphysics to other parts of philosophy; *e.g.*, ethics, logic, natural theology
 - c. Problems in metaphysics
 2. The philosophy of nature: the philosophical problems concerning the phenomena, laws, and theories of the natural sciences
[see also 10/31.B.]
 - a. The history, status, and scope of the philosophy of nature
 - b. The relation of the philosophy of nature to science, the philosophy of science, and metaphysics
 - c. The basic aspects of the natural order
 - d. The philosophy of physics
 - e. The philosophy of biology
 3. Epistemology, or theory of knowledge
 - a. The history, nature, and scope of epistemology
[for schools of thought in epistemology, see 10/53.C.]
 - b. The relation of epistemology to metaphysics, philosophy of mind, logic, and other disciplines
 - c. Problems in epistemology
 4. The philosophy of mind, or philosophical psychology
 - a. The history, nature, and scope of the philosophy of mind
 - b. The relation of the philosophy of mind to the empirical and mathematical sciences and to other philosophical disciplines

- c. Problems in the philosophy of mind
- 5. The philosophy of man, or philosophical anthropology
 - a. The history, nature, and scope of philosophical anthropology
[for schools of thought in philosophical anthropology, see 10/53.B.3.]
 - b. The relation of philosophical anthropology to physical and cultural anthropology and to other disciplines in philosophy and the social sciences
 - c. Problems in philosophical anthropology
- 6. Ethics, or moral philosophy
 - a. The history, nature, and types of ethics: the distinction between metaethics and normative ethics
 - b. The relation of ethics to other philosophical disciplines or to other branches of knowledge or experience
 - c. Problems in ethics
- 7. Political philosophy
 - a. The nature and scope of political philosophy: its relation to political science
 - b. The form of political statements and arguments
 - c. The history of political philosophy
- 8. Aesthetics
 - a. The nature and scope of aesthetics as a discipline
 - b. The development of aesthetics: approaches to the study of the aesthetic experience
 - c. Problems in aesthetics
 - d. The relation of aesthetics to other disciplines
- 9. The philosophy of language
- 10. The philosophy of logic
[see 10/11.B.]
- 11. The philosophy of mathematics
[see 10/21.B.]
- 12. The philosophy of art
[see 611.A.]
- 13. The philosophy of science
[see 10/31.B.]
- 14. The philosophy of religion
[see 811.A.]
- 15. The philosophy of law
[see 551.A.]
- 16. The philosophy of education
[see 561.A.]
- 17. The philosophy of history
[see 10/41.C.]

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles and biographies dealing with the nature and the divisions of philosophy

Aesthetics	Philosophical	Political	Rousseau,
Epistemology	Anthropology	Philosophy,	Jean-Jacques
Ethics	Philosophies of	The History of	Smith, Adam
Metaphysics	the Branches of	Western	Time
Mind, The	Knowledge		
Philosophy of			

MICROPAEDIA: Selected entries of reference information

General subjects

<i>aesthetics:</i>	eudaemonism	phenomenon	nomos
aesthetics	free will	pluralism and	political
<i>epistemology:</i>	good-reasons	monism	philosophy
a priori knowledge	theory	spiritualism	powers,
belief	metaethics	voluntarism	separation of
dualism	moral theology	<i>philosophy of mind:</i>	social contract
epistemology	normative ethics	belief	<i>other:</i>
Idéalogie	probabilism	identity theory	emergence
intuition	teleological ethics	immortality	philosophical
psychologism	virtue	intentionality	anthropology
reason	<i>metaphysics:</i>	interactionism	philosophy
<i>ethics:</i>	creative evolution	mind	teleology
altruism	dualism	mind-body	time
axiology	form	dualism	
categorical	Great Chain of	other minds	
imperative	Being	psychophysical	
choice	hylozoism	parallelism	
comparative ethics	irrationalism	<i>political philosophy:</i>	
conscience	metaphysics	divine right of	
egoism	microcosm	kings	
ethical relativism	naturalism	general will	
ethics	ontology	human rights	

Biographies

<i>aesthetics:</i>	Campanella,	Nietzsche,	<i>other:</i>
Baumgarten,	Tommaso	Friedrich	Adler, Mortimer J.
Alexander	Clauberg, Johann	Norris, John	Alembert, Jean Le
Gottlieb	Descartes, René	Schelling, Friedrich	Rond d'
Bosanquet,	Feuerbach,	Wilhelm	Aron, Raymond
Bernard	Ludwig	Joseph von	Bayle, Pierre
Croce, Benedetto	Fichte, Johann	Schopenhauer,	Collingwood, R.G.
Santayana, George	Gottlieb	Arthur	Condillac, Étienne
<i>epistemology:</i>	Geulincx, Arnold	Spinoza,	Bonnot de
Cassirer, Ernst	Green, T.H.	Benedict de	Cousin, Victor
Dühring, Eugen	Hegel, Georg	Whitehead, Alfred	Dilthey, Wilhelm
Locke, John	Wilhelm	North	Gilson, Étienne
Mill, John Stuart	Friedrich	<i>political philosophy:</i>	Gioberti, Vincenzo
<i>ethics:</i>	Heidegger, Martin	Bentham, Jeremy	Helvétius,
Abelard, Peter	Husserl, Edmund	Berlin, Sir Isaiah	Claude-Adrien
Cudworth, Ralph	Jacobi, Friedrich	Burke, Edmund	Hoffer, Eric
Cumberland,	Heinrich	Engels, Friedrich	Rodó, José
Richard	Jaspers, Karl	Han-fei-tzu	Enrique
Hutcheson, Francis	Kant, Immanuel	Herzen, Aleksandr	Spencer, Herbert
Moore, G.E.	Kierkegaard, Søren	Hobbes, Thomas	Strauss, David
Scheler, Max	Leibniz, Gottfried	Machiavelli,	Friedrich
Whewell, William	Wilhelm	Niccolò	Swedenborg,
<i>metaphysics:</i>	Lewes, George	Mill, James	Emanuel
Aurobindo, Śrī	Henry	Montesquieu,	Teilhard de
Berdyaev,	Malebranche,	Charles-Louis de	Chardin, Pierre
Nikolay	Nicolas	Secondat, baron	Vico, Giambattista
Aleksandrovich	Marcel, Gabriel	de La Brède et de	Weil, Simone
Berkeley, George	Meinong, Alexius	Paine, Thomas	Wittgenstein,
Bradley, F.H.			Ludwig

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Section 10/53. Philosophical Schools and Doctrines

A. Major philosophical schools in the West

1. Philosophical schools in antiquity and in the Middle Ages

- a. Pythagoreanism
- b. The Sophists
- c. Eleaticism
- d. Atomism
- e. Platonism
- f. Aristotelianism
- g. Stoicism
- h. Epicureanism
- i. Skepticism
- j. Scholasticism

2. Philosophical schools in the modern period

- a. Cartesianism
- b. Empiricism
[for Empiricist tendencies in earlier philosophy, see A.1.b. and i., above; for contemporary Logical Empiricism, see A.2.i., below]
- c. Rationalism
[for Rationalist tendencies in ancient and medieval philosophy, see A.1.a., c., e., and j., above]
- d. Materialism
[for dialectical Materialism, see A.2.j., below]
- e. Kantianism
- f. Idealism
- g. Hegelianism
- h. Utilitarianism
- i. Positivism and Logical Empiricism
[for metalogical studies, see 10/12.B.; for studies in the foundations of mathematics, see 10/21.B.]
- j. Marxism
- k. Realism
- l. Pragmatism
- m. Phenomenology
- n. Existentialism
- o. Analytic and Linguistic philosophy

B. Theories of Being and existence

1. Different types of metaphysical theory: Platonism; Aristotelianism; Thomism; Cartesianism; Idealism; Materialism—dialectical Materialism, Atomism, and Naturalism; Pythagoreanism; Organismic dynamism
2. Different views concerning the existence, attributes, and knowledge of God: agnosticism, atheism, Deism, fideism, humanism, pantheism, theism
3. Different conceptions of man as knower, doer, and maker: Existentialism, humanism, Phenomenology, Pragmatism, rationalism, irrationalism
4. Different views concerning the existence of the mind and its relation to the body: Materialism, dualism, immaterialism

C. Theories of thought, knowledge, and faculties of mind

1. Different conceptions of the object of knowledge: sense-datum theory, Phenomenalism, Idealism, Realism

2. Different conceptions of the validity of knowledge: Kantianism, positivism, pragmatism, Skepticism
3. Different views of the sources or foundations of knowledge: rationalism, Empiricism
4. Different views of the status of the universal: realism, conceptualism, nominalism
5. Different views of the epistemic status of scientific theories; *e.g.*, realism, conventionalism, and operationalism; the Unity of Science movement; reductionism

D. Theories of conduct

1. Metaethical theories: intuitionism, naturalism, noncognitivism, good reasons theories
2. Deontological theories: rationalism, intuitionism, Existentialism
3. Teleological theories: eudaemonism, Utilitarianism

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with Western philosophical schools and doctrines

Aristotelianism, Aristotle and	Marxism, Marx and	Religious and Spiritual Belief,
Cartesianism, Descartes and	Philosophical Schools and	Systems of
Hegelianism, Hegel and	Doctrines, Western	Thomism, Thomas
Kantianism, Kant and	Platonism, Plato and	Aquinas and

MICROPAEDIA: Selected entries of reference information

General subjects

Absolute Idealism	eclecticism	Neo-Hegelianism	Skepticism
Academy	Eleaticism	nominalism	solipsism
Alexandrist	Empiricism	personalism	Sophist
Analytic philosophy	Epicureanism	phenomenology	Stoicism
atomism	Ethical Culture	positivism	theism
Cambridge	Existentialism	pragmatism	transcendental
Platonists	idealism	process philosophy	idealism
Cynic	Latin Averroism	Pythagoreanism	Utilitarianism
Cyrenaic	Logical Positivism	rationalism	Vienna Circle
Deism	materialism	realism	
determinism	Megarian school	scholasticism	
	naturalism	sensationalism	

Biographies

Albertus Magnus, Saint	Carnap, Rudolf	Hume, David	Pico della
Apuleius, Lucius	Cohen, Hermann	Husserl, Edmund	Mirandola,
Athenagoras	Comte, Auguste	James, William	Giovanni, Count
Berdyayev, Nikolay	Cousin, Victor	Jaspers, Karl	di Concordia
Aleksandrovich	Dewey, John	Kierkegaard, Søren	Plotinus
Bernard de	Dühring, Eugen	Lewes, George	Royce, Josiah
Chartres	Duns Scotus, John	Henry	Sartre, Jean-Paul
Boethius, Anicias	Fichte, Johann	Maine de Biran,	Scheler, Max
Manlius	Gottlieb	Marie-François-Pierre	Schlick, Moritz
Severinus	Francis of	Malebranche,	Unamuno,
Bosanquet,	Meyronnes	Nicolas	Miguel de
Bernard	Gentile, Giovanni	Marcel, Gabriel	William de la
Bradley, F.H.	Godfrey of	Maritain, Jacques	Mare
Buridan, Jean	Fontaines	More, Henry	
	Green, T.H.	Ockham,	
	Heidegger, Martin	William of	

See also Sections 10/51 and 10/52

INDEX: See entries under all of the terms above

Division VI. Preservation of Knowledge

[For Part Ten headnote see page 479.]

Division VI, which contains only one section, deals with the various means, techniques, and institutions used to preserve knowledge and, by extension, the objects of knowledge. Because the preservation of knowledge is so closely bound up with technology, which has provided ever more efficient methods, there is much overlap between this section and various sections in Part Seven, and accordingly there are in the outline presented here many cross-references to that part.

Section 10/61. Institutions and Techniques for the Collection, Storage, Dissemination, and Preservation of Knowledge**A. Protection and storage of objects and artifacts****1. Museums and galleries****a. The management and maintenance of institutional collections****b. Types of museum categorized by subject area****i. General museums****ii. Museums of natural history and natural science**

[see also 355.C.6.a.]

iii. Museums of science and technology**iv. Museums of history****v. Museums of art and art galleries**

[see also 612.G.1.]

vi. Museums concerned with particular vocations: *e.g.*, farming, forestry, wine making**vii. Other museums****c. Other systems of museum classification****i. By geographical coverage****ii. By character of collection****iii. By character of provider****iv. By particular clientele****2. Libraries**

[see B.4., below]

3. Historic places and landmarks**4. Public and private collections of animals and plants**

[see also 355.C.6.]

a. Zoological gardens and aviaries**b. Aquariums****c. Botanical gardens and arboretums****5. Parks and nature preserves**

[see also 355.D.]

B. Storage and retrieval of information**1. Dictionaries and lexicons**

[see also 735.H.2.c.i.]

2. Encyclopaedias

[see also 735.H.2.c.ii.]

3. Atlases and map collections

[see also 735.H.2.c.iii.]

4. Libraries**a. Types of libraries****b. The science of library systems**

5. Archives
 6. Bibliographic and numeric databases
[see 735.H.1.b.]
 7. Magnetic and optical recordings
[see 735.F. and H.1.a.]
- C. Institutions for the advancement and dissemination of knowledge
1. Educational institutions
[see Part Five, Division VI]
 2. Academies of learning, or societies established for the advancement of knowledge
 3. Publishing: selection, preparation, and marketing of printed material
 - a. Print publishing
[see also 735.I.1.]
 - i. Books
 - ii. Newspapers
 - iii. Periodicals
 - b. Electronic publishing
 4. Broadcasting
 - a. Radio
[see also 735.I.5]
 - b. Television
[see also 735.I.6]
 5. Observatories and planetariums

Suggested reading in the *Encyclopædia Britannica*:

MACROPAEDIA: Major articles dealing with institutions and techniques for the collection, storage, dissemination, and preservation of knowledge

Broadcasting
 Encyclopaedias and Dictionaries
 Libraries
 Museums
 Publishing

MICROPAEDIA: Selected entries of reference information

General subjects

academy	broadcasting	national forest	newspaper
aquarium	dictionary	national	syndicate
archives	encyclopaedia	monument	oceanarium
astronomical	gazette	national park	pamphlet
observatory	library	national seashore	pinacotheca
atlas	little magazine	nature preserve	planetarium
aviary	magazine	news agency	publishing
aviculture	museum	newscast	wall newspaper
book	musical societies	newsletter	zoo
botanical garden	and institutions	newspaper	

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- **MICHAEL MORROW** (d. 1994). *Music Editor*, Encyclopædia Britannica. *Director*, Musica Reservata, London.
- **RAY NASH** (d. 1982). *Professor of Art*, Dartmouth College, Hanover, New Hampshire, 1949–70.
- **BRUNO NETTL**. *Professor of Music and of Anthropology*, University of Illinois at Urbana-Champaign.
- **BEAUMONT NEWHALL** (d. 1993). *Visiting Professor of Art*, University of New Mexico, Albuquerque, 1971–84. *Director*, George Eastman House, Rochester, New York, 1958–71.
- **DOROTHY MARGARET PARTINGTON** (d. 1990). *Literary critic and historian*.
- **SIR HERBERT READ** (d. 1968). *Poet and critic*. *Watson Gordon Professor of Fine Art*, University of Edinburgh, 1931–33. *Editor*, The Burlington Magazine, 1933–39. *Charles Eliot Norton Professor of Poetry*, Harvard University, 1953–54.
- **RICHARD ROUD** (d. 1989). *Film critic*, The Guardian, Manchester, 1963–69. *Program Director*, London (1959–63) and New York (1963–87) Film Festivals.
- **GEORGE SAVAGE** (d. 1982). *Art consultant*. *Author of Porcelain Through the Ages; Pottery Through the Ages; and others*.
- **NICOLAS SLONIMSKY** (d. 1995). *Conductor, composer, writer, and editor*. *Lecturer in Music*, University of California, Los Angeles, 1964–67. *Editor*, Baker's Biographical Dictionary of Musicians, 1949–93.
- **WOLFGANG STECHOW** (d. 1974). *Professor of Fine Arts*, Oberlin College, Oberlin, Ohio, 1940–63.
- **JOSHUA C. TAYLOR** (d. 1981). *Director*, National Collection of Fine Arts, Smithsonian Institution, Washington, D.C., 1970–81. *William Rainey Harper Professor of Humanities and Professor of Art*, University of Chicago, 1963–74.
- **WALTER TERRY** (d. 1982). *Dance critic and editor*, Saturday Review magazine; New York Herald Tribune; and others.
- **EVERARD M. UPJOHN** (d. 1978). *Professor of Fine Arts*, Columbia University, 1951–70.
- **PIERRE VERLET**. *Chief Curator of Art Objects from the Middle Ages to the Modern Period*, Louvre Museum, Paris, 1945–65. *Chief Curator*, National Museum of Sèvres Porcelain, Sèvres, France, 1945–65. *Chief Curator*, Cluny Museum, Paris, 1945–65.
- **RENÉ WELLEK** (d. 1995). *Sterling Professor of Comparative Literature*, Yale University, 1952–72.
- **GLYNNE WILLIAM GLADSTONE WICKHAM**. *Emeritus Professor of Drama*, University of Bristol, England; *Dean*, Faculty of Arts, 1970–72.
- **RAYMOND (HENRY) WILLIAMS** (d. 1988). *Professor of Drama*, University of Cambridge, 1974–83; *Fellow of Jesus College*, Cambridge, 1961–88.
- **C. BARRIE WILSON** (d. 1995). *Senior Vice-Principal*, University of Edinburgh, 1990–95; *Professor of Architectural Science*, 1968–95.
- **PAUL S. WINGERT** (d. 1974). *Professor of Art History and Archaeology*, Columbia University.
- **BRUNO ZEVI**. *Professor of Architectural History*, University of Rome, 1963–79.
- **CONSTANTINE APOSTOLOS DOXIADIS** (d. 1975). *Chairman*, Doxiadis Associates International, Athens; *Chairman*, Board of Directors, Doxiadis Associates, Inc., Washington, D.C. *Chairman*, Board of Directors, Athens Technological Organization. *President*, Athens Center of Ekistics.
- **EUGENE S. FERGUSON**. *Emeritus Professor of History*, University of Delaware, Newark. *Curator of Technology*, Hagley Museum, Greenville, Delaware, 1969–79.
- **NEAL FITZSIMONS**. *Principal*, Engineering Counsel, Kensington, Maryland.
- **S. PAUL JOHNSTON** (d. 1985). *Director*, National Air and Space Museum, Smithsonian Institution, Washington, D.C., 1964–69.
- **MELVIN KRANZBERG** (d. 1995). *Callaway Professor of the History of Technology*, Georgia Institute of Technology, Atlanta, 1972–88.
- **WARREN PERRY MASON** (deceased). *Senior Research Associate*, Henry Krumb School of Mines, Columbia University, 1969–77. *Head of Mechanics Research*, Bell Telephone Laboratories, Murray Hill, New Jersey, 1948–65.
- **HARVEY G. MEHLHOUSE**. *Chairman of the Board*, Western Electric Company, New York City, 1971–72; *President*, 1969–71; *Vice President*, 1965–69.
- **HARRY F. OLSON** (d. 1982). *Staff Vice President*, RCA Laboratories, Princeton, New Jersey, 1966–67; *Director*, Acoustical and Electromechanical Laboratory, 1942–66.
- **ROBERT SMITH WOODBURY** (d. 1983). *Professor of the History of Technology*, Massachusetts Institute of Technology, Cambridge.

Part Eight. Religion

- **CHARLES JOSEPH ADAMS**. *Emeritus Professor of Islāmic Studies*, McGill University, Montreal. *Editorial Board*, Encyclopaedia of Religion.
- **SALO WITTMAYER BARON** (d. 1989). *Professor of Jewish History, Literature, and Institutions*, Columbia University, 1930–63; *Director*, Center of Israel and Jewish Studies, 1950–68.
- **THE REV. COLMAN J. BARRY, O.S.B.** (d. 1994). *Regents Professor of History*, Saint John's University, Collegeville, Minnesota, 1951–94; *Director*, Institute for Spirituality, 1977–83.
- **ARTHUR LLEWELLYN BASHAM** (d. 1986). *Professor of Asian Civilizations*, Australian National University, Canberra.
- **THE REV. JAMES T. BURTCHAELL**. *Professor of Theology*, University of Notre Dame, Indiana; *Provost*, 1970–77.
- **P. JOSEPH CAHILL, S.J.** (d. 1995). *Professor of Religious Studies*, University of Alberta, Edmonton.
- **THE REV. J.V. LANGMEAD CASSERLEY** (d. 1978). *Professor of Apologetics*, Seabury-Western Theological Seminary, Evanston, Illinois, 1959–77.
- **EDWARD J.D. CONZE** (d. 1979). *Visiting Professor of Religious Studies*, University of Lancaster, England, 1973–75.
- **H. BYRON EARHART**. *Professor of Religion*, Western Michigan University, Kalamazoo.
- **GEORGE WOLFGANG FORELL**. *Carver Professor Emeritus of Religion*, University of Iowa, Iowa City.
- **JUDAH GOLDIN**. *Emeritus Professor of Post-Biblical Hebrew Literature*, University of Pennsylvania, Philadelphia.
- **HERBERT V. GUENTHER**. *Emeritus Professor of Far Eastern Studies*, University of Saskatchewan, Saskatoon.

Part Seven. Technology

- **BRIAN D.O. ANDERSON**. *Professor of Systems Engineering and Director*, Research School of Information Sciences and Engineering, Australian National University, Canberra.
- **GRACE ROGERS COOPER**. *Museum consultant*. *Curator*, Division of Textiles, National Museum of History and Technology, Smithsonian Institution, Washington, D.C., 1946–76.

- ICHIRO HORI (d. 1974). *Professor of the History of Religions, Seijo University and Kokugakuin University, Tokyo.*
- THORKILD JACOBSEN (d. 1993). *Professor of Assyriology, Harvard University, 1962–74.*

CHARLES H. LONG. *Professor of Religious Studies; Director, Center for Black Studies, University of California, Santa Barbara.*

THE REV. GEORGE W. MACRAE, S.J. (d. 1985). *Stillman Professor of Roman Catholic Theological Studies, Divinity School, Harvard University, 1973–85.*

MARTIN E. MARTY. *Fairfax M. Cone Distinguished Service Professor, Divinity School, University of Chicago. Senior Editor, The Christian Century.*

THE REV. JOHN MEYENDORFF (d. 1992). *Dean, St. Vladimir's Orthodox Theological Seminary, Tuckahoe, New York, 1984–92; Professor of Church History and Patristics, 1959–92. Professor of Byzantine and East European History, Fordham University, New York City, 1967–92.*

HAJIME NAKAMURA. *Founder-Director, Eastern Institute, Inc., Tokyo. Emeritus Professor of Indian and Buddhist Philosophy, University of Tokyo.*

- JAROSLAV JAN PELIKAN. *Sterling Professor of History, Yale University. President, American Academy of Arts and Sciences.*

- RABBI JAKOB JOSEF PETUCHOWSKI (d. 1991). *Sol and Arlene Bronstein Professor of Judeo-Christian Studies, Hebrew Union College–Jewish Institute of Religion, Cincinnati, Ohio, 1981–91.*

J. COERT RYLAARSDAM. *Emeritus Professor of Old Testament Theology, Divinity School, University of Chicago. Emeritus Professor of Theology, Marquette University, Milwaukee, Wisconsin.*

R.J. ZWI WERBLOWSKY. *Emeritus Professor of Comparative Religion, Hebrew University of Jerusalem.*

Part Nine. The History of Mankind

FREDERICK B. ARTZ (d. 1983). *Professor of History, Oberlin College, Ohio, 1934–62.*

- JACQUES BARZUN. *University Professor Emeritus, Columbia University; Dean of Faculties and Provost, 1958–67.*

DAVID BIRMINGHAM. *Professor of Modern History, University of Kent at Canterbury, England.*

JOHN F. CADY. *Distinguished Professor Emeritus of History, Ohio University, Athens.*

AINSLIE T. EMBREE. *Emeritus Professor of History, Columbia University.*

JOSEPH FLETCHER (d. 1984). *Professor of Chinese and Central Asian History, Harvard University, 1972–84.*

HERBERT S. KLEIN. *Professor of History, Columbia University.*

PHILIP A. KUHN. *Professor of History; Director, John King Fairbank Center for East Asian Research, Harvard University.*

DONALD P. LITTLE. *Professor, Institute of Islāmic Studies, McGill University, Montreal.*

DONALD M. LOWE. *Emeritus Professor of History, San Francisco State University.*

JAMES G. LYDON. *Professor of History, Duquesne University, Pittsburgh.*

PAUL T. MASON. *Professor of History, Duquesne University, Pittsburgh.*

HERBERT GEORGE NICHOLAS. *Rhodes Professor Emeritus of American History and Institutions, University of Oxford; Fellow of New College, Oxford, 1951–78.*

DONALD MACGILLIVRAY NICOL. *Koraës Professor Emeritus of Byzantine and Modern Greek History, Language, and Literature, King's College, University of London. Director, Gennadius Library, American School of Classical Studies at Athens, 1989–92.*

RICHARD E. PIPES. *Frank B. Baird, Jr., Professor of History, Harvard University.*

GORDON R. WILLEY. *Bowditch Professor Emeritus of Mexican and Central American Archaeology, Harvard University.*

GEORGE MACKLIN WILSON. *Professor of History and of East Asian Languages and Cultures, Indiana University, Bloomington.*

Part Ten. The Branches of Knowledge

MONROE C. BEARDSLEY (d. 1985). *Professor of Philosophy, Temple University, Philadelphia, 1969–84.*

- OTTO ALLEN BIRD. *Emeritus Professor of Arts and Letters, University of Notre Dame, Indiana.*

PETER G. BROWN. *Professor of Public Policy; Director, Environmental Policy Programs, University of Maryland, College Park.*

- WING-TSIT CHAN (d. 1994). *Anna R.D. Gillespie Professor of Philosophy, Chatham College, Pittsburgh, 1966–82. Professor of Chinese Philosophy and Culture, Dartmouth College, Hanover, New Hampshire, 1942–66.*

RODERICK M. CHISHOLM. *Andrew Mellon Professor Emeritus of the Humanities and Emeritus Professor of Philosophy, Brown University, Providence, Rhode Island.*

JAMES DANIEL COLLINS (d. 1985). *Professor of Philosophy, St. Louis University, Missouri.*

ALAN DONAGAN (d. 1991). *Professor of Philosophy, California Institute of Technology, Pasadena, 1984–91.*

- WILLIAM H. DRAY. *Emeritus Professor of Philosophy and of History, University of Ottawa.*

ELDON DYER (d. 1993). *Distinguished Professor of Mathematics, Graduate School, City University of New York, 1971–92.*

- NORWOOD HANSON (d. 1967). *Professor of Philosophy, Yale University, 1963–67.*

- J.H. HEXTER (d. 1996). *Distinguished Historian in Residence, Washington University, St. Louis, Missouri, 1978–86. Charles L. Stillé Professor of History, Yale University, 1967–78.*

- THE REV. ERNAN V. McMULLIN. *Professor of Philosophy, University of Notre Dame, Indiana.*

- KARL MENDER (d. 1985). *Professor of Mathematics, Illinois Institute of Technology, Chicago, 1946–71.*

- ARTHUR NORMAN PRIOR (d. 1969). *Fellow, Balliol College, University of Oxford. Professor of Philosophy, Manchester University, 1959–66.*

- NICHOLAS RESCHER. *University Professor of Philosophy, University of Pittsburgh. Editor, American Philosophical Quarterly.*

MARK A. RONAN. *Mason Professor of Pure Mathematics, University of Birmingham, England.*

PAUL ARTHUR SCHILPP (d. 1993). *Professor of Philosophy, Northwestern University, Evanston, Illinois, 1950–65. Distinguished Professor, Southern Illinois University, Carbondale, 1965–77.*

- SEYMOUR SCHUSTER. *Professor of Mathematics, Carleton College, Northfield, Minnesota.*

JULIUS R. WEINBERG (d. 1971). *Vilas Professor of Philosophy, University of Wisconsin, Madison.*

Geography

NATHANIEL O. ABELSON. *Former Map Librarian, Dag Hammarskjöld Library, United Nations, New York City.*

IBRAHIM A. ABU-LUGHOD. *Vice President, Birzeit University, West Bank. Professor of Political Science, Northwestern University, Evanston, Illinois, 1967–93.*

GEORGE I. BLANKSTEN. *Emeritus Professor of Political Science, Northwestern University, Evanston, Illinois.*

NORTON S. GINSBURG. *Emeritus Professor of Geography, University of Chicago.*

CHAUNCY D. HARRIS. *Samuel N. Harper Distinguished Service Professor Emeritus of Geography, University of Chicago.*

HELVI A. KALMAN. *Writer and Editor, Department of Public Information, United Nations, New York City, 1958–79.*

C.W. MINKEL. *Associate Vice-Chancellor; Dean, Graduate School, University of Tennessee, Knoxville.*

HANS E. PANOFSKY. *Curator of Africana, Northwestern University Library, Evanston, Illinois, 1959–91.*

G. ETZEL PEARCY (d. 1980). *Professor of Geography, California State University, Los Angeles, 1969–73.*

JOSEPH E. SCHWARTZBERG. *Professor of Geography, University of Minnesota, Minneapolis.*

IVOR G. WILKS. *Melville J. Herskovits Professor of African Studies, Northwestern University, Evanston, Illinois.*

Authors of Propædia Essays

Part One

NIGEL CALDER. *Physicist and science writer. Science Correspondent, New Statesman, 1966–71. Editor, New Scientist, 1962–66. Author of Robots; Technopolis: Social Control of the Uses of Science; and others.*

Part Two

PETER J. WYLLIE. *Petrologist, educator, and author. Professor of Geology and Chairman, Division of Geological and Planetary Sciences, California Institute of Technology, Pasadena. Author of Ultramafic and Related Rocks; The Dynamic Earth; and others.*

Part Three

RENÉ DUBOS (d. 1982). *Microbiologist, pathologist, and author. Professor of Pathology, Rockefeller University, New York City, 1957–71. Author of So Human an Animal; Mirage of Health; A God Within; and others.*

Part Four

LOREN EISELEY (d. 1977). *Anthropologist, poet, and essayist. Benjamin Franklin Professor of Anthropology and the History of Science, University of Pennsylvania, 1961–77; Curator of Early Man, University of Pennsylvania Museum, 1948–77. Author of The Immense Journey; The Invisible Pyramid; and others.*

Part Five

HAROLD D. LASSWELL (d. 1978). *Political scientist and author. Professor of Law, 1946–70, and of Political Science, 1952–70, Yale University. Author of Psychopathology and Politics; Politics: Who Gets What, When, How; A Pre-View of Policy Sciences; and others.*

Part Six

MARK VAN DOREN (d. 1972). *Poet, critic, and teacher. Professor of English, Columbia University, 1920–59. Author of lyric and narrative poems, novels, stories, plays, and works of criticism and biography.*

Part Seven

PETER RITCHIE RITCHIE-CALDER, BARON RITCHIE-CALDER (d. 1982). *Author, journalist, and educator. Senior Fellow, Center for the Study of Democratic Institutions, Santa Barbara, California, 1972–75. Montague Burton Professor of International Relations, University of Edinburgh, 1961–67. Author of Birth of the Future; Medicine and Man; The Evolution of the Machine; and others.*

Part Eight

WILFRED CANTWELL SMITH. *Educator and author. Emeritus Professor of the Comparative History of Religion, Harvard University. Author of Islam in Modern History; The Meaning and End of Religion; Questions of Religious Truth; and others.*

Part Nine

JACQUES BARZUN. *Historian, educator, and author. University Professor Emeritus, Columbia University; Dean of Faculties and Provost, 1958–67. Author of Berlioz and the Romantic Century; Darwin, Marx, and Wagner; The House of Intellect; On Writing, Publishing, and Editing; and others.*

Part Ten

MORTIMER J. ADLER (d. 2001). *Philosopher and editor. Director of the Institute for Philosophical Research, 1952–95. Editor of the Syntopicon of Great Books of the Western World; Director of Planning, Encyclopædia Britannica, Fifteenth Edition; Chairman, Board of Editors, 1974–95. Author of The Idea of Freedom; The Conditions of Philosophy; The Common Sense of Politics; and others.*

Initials of Contributors

Listed are the initials signed to articles in the MACROPAEDIA and MICROPAEDIA, the names of the persons identified by the initials, a brief description of the persons so identified, and the titles of the articles with which they were involved.

A. Morys George Lyndhurst Bruce, 4th Baron Aberdare. *Author of The Story of Tennis; Willis Faber Book of Tennis and Rackets.*

SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

A.Ad. Anthony Adamovich. *Vice President, Byelorussian Institute of Arts and Sciences, Inc., Rutherford, New Jersey. Senior Editor, Radio Liberty. Author of Opposition to Sovietization in Belorussian Literature.*

BELARUS (in part)

A.A.F. Arnold A. Friedmann. *Emeritus Professor of Design, University of Massachusetts at Amherst. Coauthor of Interior Design.*

DECORATIVE ARTS AND FURNISHINGS (in part)

A.Ai. Ayinipalli Aiyappan. *Special Officer, Tribal Research and Training Centre, Chevayur, Calicut, India. Editor of Social Revolution in a Kerala Village.*

INDIA (in part)

A.A.K. Arno Artur Kõörna. *President, Estonian Academy of Sciences, Tallinn; former Director, Institute of Economics. Author of papers on Estonia.*

BALTIC STATES (in part)

A.Al-Sh. Ahmed S. Al-Shahi. *Lecturer in Social Anthropology, University of Newcastle upon Tyne, England.*

SUDAN, THE (in part)

A.A.M. Aleksey Aleksandrovich Mints (d. 1973). *Chief, Department of Economic Geography, Institute of Geography, Academy of Sciences of the U.S.S.R., Moscow. Author of books on Transcaucasia.*

TRANSCAUCASIA (in part)

A.A.Ma. The Rev. Armand Maurer, C.S.B. *Emeritus Professor of Philosophy, Pontifical Institute of Mediaeval Studies, University of Toronto. Author of Medieval Philosophy and others.*

PHILOSOPHY, THE HISTORY OF WESTERN (in part)

A.A.P. Alexander A. Parker (d. 1989). *Professor of Spanish Literature, University of Texas at Austin, 1970–78. Author of The Allegorical Drama of Calderón and others.*

CALDERÓN DE LA BARCA, PEDRO (Micropædia)

A.A.Ps. Adamantios A. Pepelasis. *Emeritus Professor of Economics, Virginia Polytechnic Institute and State University, Blacksburg.*

TAXATION (in part)

A.A.R. Anton A. Reznicek. *Curator of Vascular Plants, University of Michigan Herbarium, Ann Arbor.*

ANGIOSPERMS (in part)

A.As. Arthur C.V.D. Aspinall (d. 1972). *Professor of Modern History, University of Reading, England, 1947–65. Author of The Cabinet Council, 1783–1835 and others.*

CANNING, GEORGE (in part) (Micropædia)

FOX, CHARLES JAMES (Micropædia)

PITT, WILLIAM, THE YOUNGER (in part)

(Micropædia)

A.A.S. Arthur A. Siebens, M.D. *Darnall Professor of Rehabilitation Medicine, Johns Hopkins University, Baltimore. Author of "The Mechanics of Breathing" in The Physiological Basis of Medical Practice.*

RESPIRATION AND RESPIRATORY SYSTEMS (in part)

A.A.Si. Andrew Annandale Sinclair. *Historian and filmmaker. Author of Guevara and others.*

GUEVARA, CHE (in part) (Micropædia)

A.B. Alan Bullock, Baron Bullock. *Founding Master of St. Catherine's College, Oxford, 1960–1980; Vice-Chancellor, University of Oxford, 1969–73. Author of Hitler and Stalin: Parallel Lives and others.*

HITLER (in part)

A.B.-B. Albert Bush-Brown (d. 1994). *Chancellor, Long Island University, Greenvale, New York, 1971–85. Author of Louis Sullivan; coauthor of The Architecture of America.*

ARCHITECTURE, THE HISTORY OF WESTERN (in part)

A.B.C. Andrew Barnett Christie, M.D. (d. 1991). *Physician, Fazakerley Hospital, Liverpool, 1946–74. Head, Department of Infectious Diseases, University of Liverpool. Author of Infectious Diseases.*

INFECTIOUS DISEASES (in part)

A.B.F. Albert B. Friedman. *William Starke Rosecrans Professor Emeritus of English Literature, Claremont Graduate School, Claremont, California. Author of The Ballad Revival; editor of Ywain and Gawain.*

LITERATURE, THE ART OF (in part)

A.B.Fo. Arthur B. Ford. *Geologist, Branch of Alaskan Geology, Geological Survey, U.S. Department of the Interior, Menlo Park, California. Author of many research reports on the geology of Antarctica.*

ANTARCTICA

A.B.G. Ashley B. Gurney (deceased). *Research Entomologist, Systematic Entomology Laboratory, U.S. Department of Agriculture, Washington, D.C., 1955–75. Author of numerous articles on the classification and distribution of insects.*

INSECTS (in part)

A.B.Ga. Alfred B. Garrett. *Emeritus Professor of Chemistry, Ohio State University, Columbus.*

DALTON, JOHN (Micropædia)

A.B.Gr. Alfred Byrd Graf. *President, Roehrs Company (horticultural publishers); Vice President, Roehrs Exotic Nurseries, Farmingdale, New Jersey. Author of Hortica and others.*

GARDENING AND HORTICULTURE (in part)

A.Bh. Agehananda Bharati (d. 1991). *Professor of Anthropology, Syracuse University, New York, 1961–91. Author of The Tantric Tradition.*

SACRED OFFICES AND ORDERS (in part)

A.B.J. Abeodu Bowen Jones. *Professor and Chairman, Department of History, University of Liberia, Monrovia. Representative of Liberia to the United Nations, 1981–85. Coeditor of The Official Papers of William V.S. Tubman, President of the Republic of Liberia.*

WESTERN AFRICA (in part)

A.B.K. Alexander B. Klots (d. 1989). *Research Associate, Department of Entomology, American Museum of Natural History, New York City. Professor of Biology, City University of New York, 1960–67. Author of Field Guide to the Butterflies of North America and others.*

INSECTS (in part)

A.B.M. Alexander B. Murphy. *Professor and Head, Department of Geography, University of Oregon, Eugene. Author of The Regional Dynamics of Language Differentiation in Belgium.*

BELGIUM (in part)

A.B.P. Sir A. Brian Pippard. *Emeritus Professor of Physics, University of Cambridge; Cavendish Professor, 1971–82. Author of Elements of Classical Thermodynamics and others.*

PHYSICAL SCIENCE, PRINCIPLES OF

A.Br. Adam Bromke. *Professor of Political Science, McMaster University, Hamilton, Ontario. Author of Poland's Politics: Idealism vs. Realism.*

GOMUŁKA, WŁADYSŁAW (Micropædia)

A.B.R. Andreas B. Rechnitzer. *Adjunct Professor of Oceanography, San Diego State University, California.*

EXPLORATION (in part)

A.B.Ri. A. Brewster Rickel. *President, Commutech Services (scientific and*

technical documentation), Boulder, Colorado. Author of manuals and articles on atmospheric measurements and instruments.

CLIMATE AND WEATHER (in part)

A.Brn. Alice Brown. Professor of Politics, University of Edinburgh, Scotland. Author of *The Scottish Electorate: The 1997 Election and Beyond*; coauthor of *Politics and Society in Scotland and others*. UNITED KINGDOM (in part)

A.Bu. Allison Butts (d. 1977). Professor of Metallurgy and Materials Science, Lehigh University, Bethlehem, Pennsylvania, Editor of *Copper: The Science and Technology of the Metal, Its Alloys and Compounds*.

INDUSTRIES, EXTRACTION AND PROCESSING (in part)

A.B.W. The Rev. Allan Bernard Wolter, O.F.M. Emeritus Professor of Philosophy, Catholic University of America, Washington, D.C. Author of *The Transcendentals and Their Function in the Metaphysics of Duns Scotus*. DUNS SCOTUS, JOHN (Micropædia)

A.B.Wa. Andrew B. Wachtel. Associate Professor of Slavic Languages and Literatures, Northwestern University, Evanston, Illinois. Author of *The Battle for Childhood: Creation of a Russian Myth*. RUSSIA (in part)

A.By. André Berry (d. 1986). Author of *Florilège des troubadours and others*. PROVENÇAL LITERATURE (Micropædia)

A.C. Annette Carson. Writer. Author of *Flight Fantastic: The Illustrated History of Aerobatics*.

AEROBATICS (Micropædia)

STUNT FLYING (Micropædia)

A.C.B. A. Craig Baird (d. 1979). Professor of Speech, University of Iowa, Iowa City, 1928–52. Author and editor of *American Public Addresses*; coauthor of *Speech Criticism and others*.

ORATORY (Micropædia)

A.C.Bi. Alan Curtis Birnholz. Associate Professor of Art History, State University of New York at Buffalo.

TOULOUSE-LAUTREC, HENRI DE (Micropædia)

A.C.Bk. Alfred C. Beck, M.D. (deceased). Professor of Obstetrics and Gynecology, State University of New York Downstate Medical Center at Brooklyn. Author of *Obstetrical Practice*.

REPRODUCTION AND REPRODUCTIVE SYSTEMS (in part)

A.C.Br. Armin C. Braun. (d. 1986). Professor of Bacteriology, 1959–81; Head, Laboratory of Plant Biology, 1955–81, Rockefeller University, New York City. Editor of *Plant Tumor Research*.

GROWTH AND DEVELOPMENT, BIOLOGICAL (in part)

A.C.D. Alyn C. Duxbury. Research Associate Professor Emeritus of Oceanography, University of Washington, Seattle. Author of *The Earth and its Oceans*; coauthor of *An Introduction to the World's Oceans*.

OCEANS (in part)

A.C.G. A.C. Grayling. Lecturer in Philosophy, Birbeck College, University of London. Senior Research Fellow, St. Anne's College, University of Oxford. Author of *An Introduction to Philosophical Logic and others*.

METAPHYSICS (in part)

A.C.Ha. Sir Alister C. Hardy (d. 1985). Linacre Professor of Zoology, University of Oxford, 1946–61. Author of "Charles Elton's Influence in Ecology" in *Journal of Animal Ecology*.

ELTON, CHARLES (in part) (Micropædia)

A.C.M. Adolfo C. Mascarenhas. Director, Institute of Resource Assessment, University of Dar es Salaam, Tanzania.

EASTERN AFRICA (in part)

A.C.Mi. Andrew C. Millington. Professor of Geography, University of Leicester, England. Coauthor of *Environmental Change in Drylands and others*.

SOUTHERN AFRICA (in part)

A.C.O. Albert Cook Outler (d. 1989). Professor of Theology, Southern Methodist University, Dallas, Texas, 1951–79. Author of *Who Trusts in God*.

DOCTRINES AND DOGMAS, RELIGIOUS (in part)

A.C.P.S. Andrew C.P. Sims, M.D. Professor of Psychiatry, University of Leeds, England; Honorary Consultant, St. James's University Hospital. Author of *Symptoms in the Mind and others*.

MENTAL DISORDERS AND THEIR TREATMENT (in part)

A.Cr. Arthur Cronquist (d. 1992). Senior Scientist, New York Botanical Garden, Bronx, 1974–92. Author of *An Integrated System of Classification of Flowering Plants and others*.

ANGIOSPERMS (in part)

A.C.S. Andrew Carrington Shelton. Professor of Art History, University of Delaware, Newark.

INGRES, JEAN-AUGUSTE-DOMINIQUE (Micropædia)

A.C.U. Arthur Canfield Upton, M.D. Clinical Professor of Pathology and Radiology, University of New Mexico, Albuquerque. Emeritus Professor of Environmental Medicine, New York University, New York City. Author of *Radiation Injury: Effects, Principles, and Perspectives*.

RADIATION (in part)

A.C.W.M. Adrian C.W. Mitchell. Associate Professor of English, University of Sydney. Coeditor of *Oxford Anthology of Australian Literature*.

AUSTRALIA AND NEW ZEALAND, LITERATURES OF (in part)

A.D. Allison Danzig (d. 1987). Sportswriter, The New York Times, 1923–68. Author of *The History of American Football; The Racquet Game; and others*.

SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

A.Da. Adrien Dansette (d. 1976). Member of the Academy of Moral and

Political Sciences, Paris. Author of *Les Affaires de Panama*.

LESSEPS, FERDINAND, VICOMTE DE (Micropædia)

A.D.B. Alexander D. Baxter (d. 1988). Engineering Consultant. Professor of Aircraft Propulsion, College of Aeronautics, Cranfield, England, 1950–57. Director, de Havilland Engine Co. Ltd., 1958–63. Author of *Design of Liquid Propellant Rocket Motors*.

ENERGY CONVERSION (in part)

A.D.C. Alastair Dougal Couper. Professor of Maritime Studies, University of Wales College of Cardiff. Editor of *The Times Atlas and Encyclopaedia of the Sea*.

ATLANTIC OCEAN, THE (in part)

A.De. Aleksandar R. Despić. Professor of Physical Chemistry, University of Belgrade. Contributor to *Modern Aspects of Electrochemistry and others*.

CHEMICAL REACTIONS (in part)

A. de A.-M. Alamiro de Avila-Martel (d. 1990). Professor of Roman Law and History of Law; Director of the Central Library, University of Chile, Santiago.

COINS AND COINAGE (in part)

A. De C. Alexander De Conde. Emeritus Professor of History, University of California, Santa Barbara. Author of *The Quasi-War: The Politics and Diplomacy of the Undeclared War with France, 1797–1801 and others*.

HAMILTON, ALEXANDER (in part) (Micropædia)

A.D.G. Andrew Dewar Gibb (d. 1974). Regius Professor of Law, University of Glasgow, 1934–58. Coauthor of *Scottish Judicial Dictionary and others*.

LEGAL SYSTEMS, THE EVOLUTION OF MODERN WESTERN (in part)

A.D.H.B. Adrian David Hugh Bivar. Emeritus Professor of Iranian Studies, School of Oriental and African Studies, University of London.

IRAN (in part)

A.D.H.C. Antony Dacres Hippiusley Cox (d. 1988). Author of *A Seat at the Circus*. CIRCUS (in part)

A.Di. Aubrey Diem. Professor of Geography, University of Waterloo, Ontario. Author of *Switzerland: Land, People, Economy and others*.

EUROPE (in part)

SWITZERLAND (in part)

A.D.L. Arthur D. Loewy. Professor of Neurobiology, Washington University School of Medicine, St. Louis, Missouri. Coeditor of *Central Regulation of Autonomic Functions*.

NERVES AND NERVOUS SYSTEMS (in part)

A.D.M. Arthur D. Murphy. Adjunct Professor of Cinema, University of Southern California, Los Angeles.

MOTION PICTURES (in part)

A.D.Mo. Arnaldo Dante Momigliano (d. 1987). Alexander White Visiting Professor, University of Chicago, 1975–87. Professor of Ancient History, University College, University of London, 1951–75. Author of

Claudius, The Emperor and His Achievement and others.

CLAUDIUS I (Micropædia)

A.D.N. Arne D. Naess. *Emeritus Professor of Philosophy, University of Oslo, Norway. Author of Four Modern Philosophers and others.*

HEIDEGGER, MARTIN (Micropædia)

A.Do. Andreas Dorpalen (d. 1982). *Professor of History, Ohio State University, Columbus, 1958–78. Author of Hindenburg and the Weimar Republic.*

HINDENBURG, PAUL VON (Micropædia)

A.D.R. Andrew D. Roberts. *Professor of the History of Africa, School of Oriental and African Studies, University of London. Author of A History of Zambia; editor of The Colonial Moment in Africa and others.*

SOUTHERN AFRICA (in part)

Ad.S. Adrian Shubert. *Professor of History, York University, North York, Ontario. Author of The Land and People of Spain and others.*

SPAIN (in part)

A.Du. The Rev. Avery Dulles, S.J. *Laurence J. McGinley Professor of Religion and Society, Fordham University, New York. Author of Models of Revelation.*

DOCTRINES AND DOGMAS, RELIGIOUS (in part)

A.E.A. Alfred E. Alford. *Managing Director, Media & Marketing Ltd., Belize.*

CENTRAL AMERICA (in part)

A.E.Ar. Annette Elizabeth Armstrong. *Former Fellow and Tutor in Modern Languages, Somerville College, Oxford; former Lecturer in French Literature, University of Oxford. Author of Ronsard and the Age of Gold.*

RONSARD, PIERRE DE (Micropædia)

A.Eb. Arimichi Ebisawa (d. 1992). *Professor of History, International Christian University, Tokyo.*

ODA NOBUNAGA (Micropædia)

A.E.Cn. Aksel E. Christensen (d. 1981). *Professor of History, University of Copenhagen, 1948–76.*

DENMARK (in part)

A.E.El. Albert Edward Elsen (d. 1995). *Haas Professor of Art History, Stanford University, California, 1975–95. Author of Origins of Modern Sculpture and others.*

SCULPTURE, THE HISTORY OF WESTERN (in part)

A.E.M. Adolphe Erich Meyer (d. 1988). *Professor of Educational History, New York University, New York City, 1946–63. Author of An Educational History of the American People.*

EDUCATION, HISTORY OF (in part)

A.E.S. Alan Edouard Samuel. *Professor of Greek and Roman History, University College, University of Toronto. Author of From Athens to Alexandria and others.*

EGYPT (in part)

A.E.Sa. A. Edward Safarian. *Emeritus Professor of Economics; Professor of International Business, University of Toronto. Author of Multinational Enterprise and Public Policy and others.*

ECONOMIC GROWTH AND PLANNING (in part)

A.E.Sc. Alfred Eric Scott (d. 1989). *Editor in Chief, Editorial and Publications Section, Commonwealth Scientific and Industrial Research Organization, Melbourne.*

AUSTRALIA (in part)

A.E.Si. Akiba Ernst Simon. *Emeritus Professor of Education, Hebrew University of Jerusalem. Author of Martin Bubers lebendiges Erbe.*

BUBER, MARTIN (Micropædia)

A.E.Sm. Arthur Eltringham Smailes (d. 1984). *Professor of Geography, Queen Mary College, University of London, 1955–73.*

EUROPE (in part)

A.E.So. Andrew E. Soltis. *Columnist, Chess Life. Chess columnist and reporter, New York Post. Author of Pawn Structure Chess and many others.*

CHESS

A.E.Ta. Alfred Edward Taylor (d. 1945). *Professor of Moral Philosophy, University of Edinburgh, 1924–41. Author of Plato; Socrates; and others.*

PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (in part)

SOCRATES

A.E.W. Albert E. Wood. *Emeritus Professor of Biology, Amherst College, Massachusetts.*

MAMMALS (in part)

A.F.A.M. Alice F.A. Mutton (d. 1979). *Reader in Geography, Queen Mary College, University of London. Author of Central Europe; Western Europe.*

ATLANTIC OCEAN, THE (in part)

EUROPE (in part)

A.F.B. The Hon. Alastair Francis Buchan (d. 1976). *Montague Burton Professor of International Relations, University of Oxford, 1972–76. Founder and Director, International Institute for Strategic Studies, London, 1958–69. Author of The Spare Chancellor: The Life of Walter Bagehot.*

BAGEHOT, WALTER (Micropædia)

A.F.Bu. Anthony F. Buccini. *Research Associate, Department of Linguistics, University of Chicago. Author of "Ontstaan en vroegste ontwikkeling van het Nederlandse taalandschap" in Taal en Tongval (vol. 48).*

LANGUAGES OF THE WORLD (in part)

A.F.C. Andrew F. Clark. *Associate Professor of History, University of North Carolina, Wilmington. Author of From Frontier to Backwater: Economy and Society in the Upper Senegal Valley (West Africa), 1850–1920.*

WESTERN AFRICA (in part)

A.Fe. Albert Feuerwerker. *Professor of History, University of Michigan, Ann Arbor. Author of China's Early Industrialization.*

CHINA (in part)

A.Fi. Andrew Field. *Professor of Comparative Literature, Griffith University, Brisbane, Australia. Author of Nabokov: His Life in Art; Nabokov: His Life in Part.*

NABOKOV, VLADIMIR (Micropædia)

A.F.L.B. Alfred Felix L. Beeston (d. 1995). *Professor of Arabic, University of Oxford, 1955–79. Author of Sabaic Grammar and others.*

ARABIA (in part)

A.Fr. Lady Antonia Fraser. *Writer. Author of Mary, Queen of Scots and many others.*

MARY (SCOTLAND) (Micropædia)

A.F.R. Anne F. Rockwell. *Freelance writer and illustrator. Author of Glass, Stones and Crown: The Abbé Suger and the Building of St. Denis and others.*

SUGER (Micropædia)

A.F.Sh. Arthur Frank Shore (d. 1994). *Brunner Professor of Egyptology, University of Liverpool, England, 1974–91. Author of Portrait Painting from Roman Egypt.*

PAINTING, THE HISTORY OF WESTERN (in part)

SCULPTURE, THE HISTORY OF WESTERN (in part)

A.Fu. André Fu-Kiau kia Bunseki-L. *Director, Centre of Development and Scientific Research in African Languages, Kumba, Zaïre.*

CENTRAL AFRICA (in part)

A.F.W. Arthur F. Wright (d. 1976). *Charles Seymour Professor of History, Yale University, 1961–76. Author of "The Formation of Sui Ideology" in Chinese Thought and Institutions.*

WEN TI (SUI DYNASTY) (Micropædia)

A.F.We. Arthur Frederick Wells (d. 1966). *Praelector in Classics, University College, University of Oxford.*

LUCRETIVS (Micropædia)

A.G. Allen Guttman. *Professor of English and American Studies, Amherst College, Massachusetts. Author of A Whole New Ball Game and others.*

SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

A.G.B. Agadjan G. Babaev. *President, Academy of Sciences of the Republic of Turkmenistan, Ashkhabad. Editor of Shifting Sands in the Deserts of the U.S.S.R.*

ASIA (in part)

A.G.B.H. Åke Gunnar Birger Hultkrantz. *Emeritus Professor of Comparative Religion, University of Stockholm. Author of The Study of American Indian Religions and others.*

AMERICAN PEOPLES, NATIVE (in part)

A.Ge. Arthur Gelb. *Vice President, New York Times Company Foundation; Managing Editor, The New York Times, 1986–89. Coauthor of O'Neill.*

O'NEILL, EUGENE (in part) (Micropædia)

A.G.G. Alfred G. Gerteiny. *Former Professor of Middle-Eastern and African Studies, University of Bridgeport, Connecticut. Author of Mauritania.*

WESTERN AFRICA (in part)

A.G.H. A. Gordon Hammer. *Emeritus Professor of Psychology, Macquarie University, North Ryde, Australia. Author*

of Elementary Matrix Algebra for Psychologists and Social Scientists.
HYPNOSIS (*in part*) (Micropædia)

A.G.Ha. The Rev. Adalbert G. Hamman. Professor at Patristic Institute, Rome. Editor, *Patrologiae Latinae Supplementum*. Author of *La Prière*. RITES AND CEREMONIES, SACRED (*in part*)

A.Gi. Alexander Gillies (d. 1977). Professor of German Language and Literature, University of Leeds, England, 1945–72. Author of *Goethe's Faust: An Interpretation and many other books on German writers and literature*. GERMAN LITERATURE (*in part*)

A.G.J. Adriaan G. Jongkees. Former Professor of Medieval History, State University of Groningen, The Netherlands. Author of *Het koninkrijk Friesland in de vijftiende eeuw*. WILLIAM I (NETHERLANDS STADHOLDER) (*in part*) (Micropædia)

A.G.L. Andrew George Lehmann. Emeritus Professor, School of European Studies, University of Buckingham, England. Author of *Sainte-Beuve: A Portrait of the Critic and others*. SAINTE-BEUVE, CHARLES-AUGUSTIN (*in part*) (Micropædia)

A.G.Ly. A. Gordon Lyne (deceased). Senior Principal Research Scientist, Division of Wildlife Research, Commonwealth Scientific and Industrial Research Organization, Blacktown, Australia. Author of *Marsupials and Monotremes of Australia*. MAMMALS (*in part*)

A.G.M. Alan Gibbs Massey. Reader in Inorganic Chemistry, Loughborough University of Technology, England. Coauthor of *Inorganic Chemistry in Non-aqueous Solvents*. CHEMICAL ELEMENTS (*in part*)

A.G.Ma. Alla Genrikhovna Massevitch. Leading Scientist, Astronomical Institute, Russian Academy of Sciences, Moscow; former Vice President, Astronomical Council. Author of *Life of the Sun*.

AMBARTSUMIAN, VIKTOR AMAZASPOVICH (Micropædia)

A.G.M.v.M. Andrew G.M. van Melsen. Emeritus Professor of Philosophy, Catholic University of Nijmegen, The Netherlands. Author of *From Atomos to Atom and others*.

PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (*in part*)

A.G.N. Allen G. Noble. Professor of Geography, University of Akron, Ohio. Coauthor of *Indian Urbanization and Planning: Vehicles of Modernization*. INDIA (*in part*)

A.G.N.F. Antony Garrard Newton Flew. Emeritus Professor of Philosophy, University of Reading, England. Author of *God: A Critical Enquiry: God, Freedom and Immortality*.

RELIGIOUS AND SPIRITUAL BELIEF, SYSTEMS OF (*in part*)

A.Go. Adam Gopnik. Editor and staff writer, *The New Yorker*. Coeditor of

Modern Art and Popular Culture: Readings in High and Low.

UNITED STATES OF AMERICA (*in part*)

A.G.W. A. Geoffrey Woodhead. Fellow of Corpus Christi College, Cambridge; Emeritus Lecturer in Classics, University of Cambridge. Author of *The Greeks in the West and others*.

HISTORY, THE STUDY OF (*in part*)

A.H.A. A. Hilary Armstrong. Gladstone Professor Emeritus of Greek, University of Liverpool. Editor of *The Cambridge History of Later Greek and Early Mediaeval Philosophy*; translator of Plotinus.

PLATONISM, PLATO AND (*in part*)
PLOTINUS (Micropædia)

A.H.Ao. The Rev. Anselm H. Amadio. Chaplain; Instructor in Philosophy, Illinois Institute of Technology, Chicago. Staff Writer, *Philosophy and Religion*, *Encyclopædia Britannica*, Chicago, 1970–73.

ARISTOTELIANISM, ARISTOTLE AND (*in part*)
PALAMAS, SAINT GREGORY (Micropædia)

Ah.A.S. Ahmad Alawad Sikainga. Assistant Professor of History, Ohio State University, Columbus. Author of *Western Bahr al-Ghazal Under British Rule, 1898–1956 and others*.

SUDAN, THE (*in part*)

A.H.C. Sir Alan H. Cook. Master of Selwyn College, Cambridge, 1983–93; Jacksonian Professor Emeritus of Natural Philosophy, University of Cambridge. Author of *The Interiors of the Planets and others*.

GRAVITATION (*in part*)

A.H.Ca. Arthur H. Cash. Distinguished Professor of English, State University of New York College at New Paltz. Author of *Laurence Sterne: The Early and Middle Years and others*.

STERNE, LAURENCE (Micropædia)

A.H.D. Andrew Hutchinson Dawson. Senior Lecturer in Geography, University of St. Andrews, Scotland. Author of *A Geography of European Integration and others*.

POLAND (*in part*)

WARSAW (*in part*)

A.H.De. Armand H. Delsemme. Distinguished University Professor Emeritus of Astrophysics, University of Toledo, Ohio. Interdisciplinary Scientist, Comet Rendezvous and Asteroid Flyby Mission, National Aeronautics and Space Administration. Editor of *Comets, Asteroids, Meteorites*.

SOLAR SYSTEM, THE (*in part*)

A.H.E. Archie H. Easton (d. 1988). Professor of Mechanical and Civil Engineering, University of Wisconsin, Madison, 1953–77.

TRANSPORTATION (*in part*)

A.H.F. Rabbi Albert H. Friedlander. Dean of Rabbinic Studies, Leo Baeck College, London. Minister, Westminster Synagogue, London. Author of *Leo Baeck: Teacher of Theresienstadt*.

BAECK, LEO (Micropædia)

A.H.Ho. Albert Habib Hourani (d. 1993). *Reader in the Modern History of the Middle East*, University of Oxford. Author of *A History of the Arabic Peoples and others*. SYRIA (*in part*)

A.H.M. Allan H. Meltzer. Allan H. Meltzer University Professor of Political Economy, Carnegie Mellon University, Pittsburgh, Pennsylvania. Chairman of the International Financial Institution Advisory Commission, U.S. Congress, 1999–2000.

MONEY (*in part*)

A.H.McD. Alexander Hugh McDonald (d. 1979). Lecturer in Ancient History, University of Cambridge, 1952–73. Author of *Republican Rome*.

TACITUS (*in part*) (Micropædia)

A.H.M.J. Arnold Hugh Martin Jones (d. 1970). Professor of Ancient History, University of Cambridge, 1951–70.

PALESTINE (*in part*)

A.H.M.K.-G. Anthony Hamilton Millard Kirk-Greene. Emeritus Lecturer in the Modern History of Africa, University of Oxford; Emeritus Fellow of St. Antony's College, Oxford. Author of *Crisis and Conflict in Nigeria, 1966–1967 and others*. WESTERN AFRICA (*in part*)

A.H.P. Arnold H. Price. Historian. Former Area Specialist for Central Europe, Library of Congress, Washington, D.C. CLAUSEWITZ, CARL VON (Micropædia)

A.H.Sa. A.H. Saxon. Freelance writer. Author of *The Life and Art of Andrew Ducrow and the Romantic Age of the English Circus*; P.T. Barnum.

CIRCUS (*in part*)

A.Hy. Arthur Hedley (d. 1969). Secretary, British Chopin Society. Vice President, Jury of International Chopin Competitions, Warsaw, 1949–65. CHOPIN, FRÉDÉRIC (*in part*) (Micropædia)

A.I.I. Aleksandr Ilyich Imshenetsky. Former Senior Research Associate, Scientific Council on the Location of U.S.S.R. Productive Forces, Academy of Sciences of the U.S.S.R., Moscow. CENTRAL ASIA (*in part*)

Ai.S. Aidan William Southall. Emeritus Professor of Anthropology, University of Wisconsin, Madison. Editor of *Social Change in Modern Africa*; coeditor of *Madagascar: Society and History*. MADAGASCAR (*in part*)

A.J.A. A. John Arnfield. Professor of Geography, Ohio State University, Columbus.

CLIMATE AND WEATHER (*in part*)

A.J.B. Alan John Barnard. Reader in Social Anthropology, University of Edinburgh. Coauthor of *Research Practices in the Study of Kinship*.

FAMILY AND KINSHIP

A.J.C. Arthur J. Conacher. Associate Professor of Geography, University of Western Australia, Nedlands. Coauthor of *Rural Land Degradation in Australia and others*; editor of *Readings in Australian Geography*.

AUSTRALIA (*in part*)

A.J.Ca. **A.J. Cain.** *Former Derby Professor of Zoology, University of Liverpool, England. Editor of Function and Taxonomic Importance.*

BIOLOGICAL SCIENCES, THE (in part)

A.J.D. **Arthur J. Dommen.** *Freelance researcher on Laos. Agricultural Economist, Economic Research Service, U.S. Department of Agriculture, Washington, D.C., 1980–94. Author of Laos: Keystone of Indochina.*

SOUTHEAST ASIA (in part)

A.J.De. **Adrian J. Desmond.** *Honorary Research Fellow in Biology, University College, London. Author of Huxley: From Devil's Disciple to Evolution's High Priest; coauthor of Darwin.*

DARWIN

A.J.E. **Armand J. Eardley** (d. 1972). *Professor of Geology, University of Utah, Salt Lake City, 1965–70; Dean, College of Mines and Mineral Industries, 1954–65. Author of Structural Geology of North America.*

NORTH AMERICA (in part)

A.J.F.G. **Anthony J.F. Griffiths.** *Professor of Botany, University of British Columbia, Vancouver.*

GENETICS AND HEREDITY (in part)

A.J.H. **Arlen J. Hansen** (d. 1993). *Professor of English, University of the Pacific, Stockton, California, 1974–93.*

LITERATURE, THE ART OF (in part)

A.J.I. **Aaron J. Ihde,** *Emeritus Professor of Chemistry and History of Science, University of Wisconsin, Madison. Author of The Development of Modern Chemistry.*

PAULING, LINUS (in part) (Micropædia)

A.J.L. **Anthony James Leggett.** *John D. and Catherine T. MacArthur Professor and Professor of Physics, University of Illinois at Urbana-Champaign. Author of The Problems of Physics.*

MATTER (in part)

A.J.P. **Anthony J. Podlecki.** *Professor of Classics, University of British Columbia, Vancouver. Author of The Political Background of Aeschylean Tragedy and others.*

GREEK DRAMATISTS, THE CLASSICAL (in part)

A.J.Sc. **Alvin J. Schumacher.** *Author of Thunder on Capitol Hill: The Life of Chief Justice Roger B. Taney.*

TANEY, ROGER BROOKE (Micropædia)

A.J.T. **Arnold Joseph Toynbee** (d. 1975). *Director of Studies, Royal Institute of International Affairs, London, 1925–55. Research Professor of International History, University of London, 1925–55. Author of A Study of History and many others.*

CAESAR (in part)

TIME (in part)

A.J.V. **Alan John Villiers** (d. 1982). *Freelance writer. President, Society for Nautical Research, London. Author of Captain James Cook; The Way of a Ship; and many others.*

COOK, JAMES (Micropædia)

A.K. **Alfred Kröner.** *Professor of Geology, Johannes Gutenberg University of Mainz, Germany. Editor of Precambrian Plate Tectonics.*

AFRICA (in part)

A.Ka. **Adrienne L. Kaeppler.** *Curator of Oceanic Ethnology, National Museum of Natural History, Smithsonian Institution, Washington, D.C. Author of Hula Pahu (vol. 1).*

OCEANIC ARTS (in part)

A.K.B. **Alan K. Bowman.** *Lecturer in Ancient History, University of Oxford; Student and Tutor, Christ Church, Oxford. Author of Egypt After the Pharaohs.*

EGYPT (in part)

A.K.Bi. **Alan K. Binder.** *Editor, Ward's Automotive Yearbook. Coeditor of and contributor to General Motors in the 20th Century.*

INDUSTRIES, MANUFACTURING (in part)

A.K.C. **The Rt. Rev. Albert Kenneth Cragg.** *Assistant Bishop, Diocese of Oxford. Reader in Religious Studies, University of Sussex, Brighton, England, 1973–78. Author of Counsels in Contemporary Islam and others.*

ISLĀM, MUHAMMAD AND THE RELIGION OF (in part)

A.K.Ca. **Alan K. Campbell.** *Former Vice Chairman of the Board and Executive Vice President, Management and Public Affairs, ARA Services, Inc., Philadelphia. Dean, Maxwell Graduate School of Citizenship and Public Affairs, Syracuse University, New York, 1969–76. Author of The States and the Urban Crisis.*

UNITED STATES OF AMERICA (in part)

A.K.Ch. **Abdel Kader Chanderli** (d. 1993). *Senior Adviser, the Arab Fund, Kuwait. President and General Manager, C.A.M.E.L. Petroleum Company, Algiers, 1969–75. Ambassador of Algeria to the United Nations, 1962.*

NORTH AFRICA (in part)

A.K.D. **Ashok K. Dutt.** *Professor of Geography and Planning, University of Akron, Ohio. Coauthor of Atlas of South Asia.*

INDIA (in part)

A.Ke. **Annajane Kennard.** *Former Librarian, Straits Times Press, Malaysia.*

SOUTHEAST ASIA (in part)

A.K.H. **A. Kent Hieatt.** *Emeritus Professor of English, University of Western Ontario, London. Author of Short Time's Endless Monument: The Symbolism of the Numbers in Spenser's Epithalamion and others; coeditor of Spenser's Selected Poetry.*

SPENSER, EDMUND (in part) (Micropædia)

A.Kn. **Arthur Knight** (d. 1991). *Professor of Cinema, University of Southern California, Los Angeles, 1967–85. Film Critic, The Hollywood Reporter, 1973–86. Author of The Liveliest Art; The Hollywood Style.*

CHAPLIN, CHARLIE (Micropædia)

A.Ko. **Arthur Koestler** (d. 1983). *Author of The Act of Creation; Darkness at Noon; and many others.*

HUMOUR AND WIT

A.Kr. **Arthur Krystal.** *Author of numerous articles and essays for such publications as The American Scholar, The New Yorker, and The Times Literary Supplement.*

BOXING (in part)

A.K.R. **A.K. Ramanujan** (d. 1993). *William E. Colvin Professor, Departments of South Asian Languages and Civilizations and of Linguistics, University of Chicago, 1983–93. Author of Speaking of Śiva and others.*

SOUTH ASIAN ARTS (in part)

A.K.S. **Arthur K. Solomon.** *Emeritus Professor of Biophysics, Medical School, Harvard University. Author of numerous scientific papers and of Why Smash Atoms?*

BIOLOGICAL SCIENCES, THE (in part)

A.K.Se. **Anna K. Seidel.** *Member, French School of the Far East, Kyōto, Japan. Author of La divinisation de Lao tseu dans le taoïsme des Han.*

TAOISM (in part)

A.Ku. **Adam Kuper.** *Professor of Social Anthropology, Department of Human Sciences, Brunel University, Uxbridge, England. Author of Culture: The Anthropologists' Account; The Chosen Primate: Human Nature and Cultural Diversity; coeditor of The Social Sciences Encyclopedia.*

SOCIAL SCIENCES (in part)

A.K.V. **Arun Kumar Varshneya.** *Professor of Glass Science and Engineering, New York State College of Ceramics at Alfred University. Author of Fundamentals of Inorganic Glasses.*

INDUSTRIAL GLASS

Ak.W. **Akira Watanabe** (deceased). *Chairman, Department of Geography, Ochanomizu Women's University, Tokyo. Editor of Gazetteer of Japan.*

JAPAN (in part)

A.Ky. **Ado Kyrrou.** *Writer and motion-picture and television director. Author of Le Surréalisme au cinéma; Luis Buñuel; and others.*

BUÑUEL, LUIS (in part) (Micropædia)

A.L. **Alberto Lecco.** *Novelist, poet, essayist, and reviewer. Author of Anteguerra and many others.*

MILAN

A.La. **Abdallah Laroui.** *Professor of History, Mohammed V University, Rabat, Morocco. Author of History of the Maghrib and others.*

NORTH AFRICA (in part)

A.L.al-S.M. **Afaf Lutfi al-Sayyid Marsot.** *Professor of History, University of California, Los Angeles. Author of Egypt and Cromer.*

CROMER, EVELYN BARING, 1ST EARL OF (Micropædia)

Al.B. **Alfredo Bosio.** *Former Professor of Medieval History, University of Pavia, Italy. Author of Storia di Milano.*

SFORZA, LUDOVICO (Micropædia)

A.L.B. **Arthur Llewellyn Basham** (d. 1986). *Professor of Asian Civilizations, Australian National University, Canberra.*

Author of History and Doctrines of the Ajivikas and others.

HINDUISM (in part)

Al.Be. **Alfons Becker.** *Professor of Medieval History, Johannes Gutenberg University of Mainz, Germany. Author of Papst Urban II (1088–1099) and others.*
URBAN II (Micropædia)

Al.Bo. **Sir Alan Bowness.** *Director, Henry Moore Foundation, London, 1988–94. Director, Tate Gallery, London, 1980–88. Author of Modern European Art; Recent British Painting.*

COROT, CAMILLE (Micropædia)

MOORE, HENRY (in part) (Micropædia)

Al.C. **Alphonse Chapanis.** *Human factors consultant. Professor of Psychology, Johns Hopkins University, Baltimore, Maryland, 1963–83. Author of Research Techniques in Human Engineering.*

INDUSTRIAL ENGINEERING AND PRODUCTION MANAGEMENT (in part)

A.Le. **Aureliano Leite** (d. 1976). *President, São Paulo Historical and Geographical Institute. Member, São Paulo Academy of Letters; Brazilian Historical and Geographical Institute. Author of História da Civilização Paulista.*
SÃO PAULO (in part)

Al.G. **Albert Goodwin** (d. 1995). *Professor of Modern History, Victoria University of Manchester, 1953–69. Author of The French Revolution.*

LOUIS XVI (FRANCE) (Micropædia)

NECKER, JACQUES (Micropædia)

A.L.G. **Arnold L. Gordon.** *Professor of Oceanography, Columbia University. Editor of Studies in Physical Oceanography (2 vol.).*

OCEANS (in part)

Al.Go. **Alan Gowans.** *Director, National Images of North American Living, Washington, D.C. Emeritus Professor of History in Art, University of Victoria, British Columbia. Author of Styles and Types of North American Architecture and others.*

ARCHITECTURE, THE ART OF (in part)

Al.Gr. **Alan Gregg, M.D.** (d. 1957). *Vice President, Rockefeller Foundation, 1951–56; Director of Medical Sciences, 1930–51.*

MEDICINE (in part)

A.L.-Ho. **Alexander Marie Norbert Lernet-Holenia** (d. 1976). *Novelist and playwright. Author of Prinz Eugen.*
EUGENE OF SAVOY (Micropædia)

A.Li. **Assar Lindbeck.** *Professor of International Economics; Director, Institute for International Economic Studies, University of Stockholm. Author of A Study in Monetary Analysis.*

GOVERNMENT FINANCE (in part)

A.Lip. **Adolf Lippold.** *Professor of History, University of Regensburg, Germany. Author of Theodosius der Grosse und seine Zeit and others.*

THEODOSIUS I (ROMAN AND BYZANTINE EMPIRE) (Micropædia)

A.L.M. **Akinlawon Ladipo Mabogunje.** *Resource Fellow, Development Policy*

Centre, Ibadan. Former Pro-Chancellor, Ogun State University, Ago-Iwoye, Nigeria. President, International Geographical Union, 1980–84. Author of Urbanization in Nigeria and others.

AFRICA (in part)

Al.N. **Allan Nevins** (d. 1971). *Historian. Senior Research Associate, Henry E. Huntington Library and Art Gallery, San Marino, California, 1958–69. Dewitt Clinton Professor of History, Columbia University, 1931–58. Author of The American States During and After the Revolution; The Emergence of Modern America; and many biographies.*

WASHINGTON, GEORGE (in part)

A.Lo. **Alan Logan.** *Professor of Geology, University of New Brunswick, Saint John. Coeditor of The Permian and Triassic Systems and Their Mutual Boundary.*
GEOCHRONOLOGY (in part)

A.L.P. **Adolph L. Ponikvar.** *Technical writer. Coauthor of Cooperative Research and Development and others.*

INDUSTRIES, EXTRACTION AND PROCESSING (in part)

Al.R. **Alfredo Riva.** *Assistant Professor of Industrial Chemistry, University of Bologna, Italy.*

MALPIGHI, MARCELLO (in part)
(Micropædia)

A.L.R. **Alexander L. Ringer.** *Emeritus Professor of Musicology, University of Illinois at Urbana-Champaign. Author of Arnold Schoenberg: The Composer as Jew and others.*

MUSIC, THE ART OF (in part)

A.L.Ra. **Arthur Lionel Rawlings** (d. 1959). *Chief Research Engineer, Bulova Research and Development Laboratories, Woodside, New York.*

NAVIGATION (in part)

Al.Re. **Albert Resis.** *Emeritus Professor of History, Northern Illinois University, De Kalb. Author of articles on Russian and Soviet history.*

LENIN

Al.S. **Albert M. Soboul** (d. 1982). *Professor of the History of the French Revolution, University of Paris I. Author of Précis d'histoire de la révolution française and others.*

CARNOT, LAZARE (Micropædia)

DANTON, GEORGES (Micropædia)

A.L.S. **A.L. Srivastava** (deceased). *Professor of History, Āgra College, Āgra University, India. Author of The Mughal Empire and others.*

INDIA (in part)

A.L.T. **Sir A. Landsborough Thomson** (d. 1977). *President, British Ornithologists' Union, 1948–55. President, Zoological Society of London, 1954–60. Chairman of Trustees, British Museum (Natural History), London, 1967–69. Author of Problems of Bird Migration.*

BIRDS (in part)

A.L.W. **A.L. Waddams.** *Manager, Market Research and Information Division, BP Chemicals (U.K.) Ltd., London. Author of Chemicals from Petroleum and others.*

INDUSTRIES, EXTRACTION AND PROCESSING (in part)

A.M. **Abdou Moumouni** (d. 1991). *Director, Office of Solar Energy, Niamey, Niger. Author of L'Education en Afrique.*
EDUCATION, HISTORY OF (in part)

A.Ma. **Andrew Henry Robert Martindale** (d. 1995). *Professor of Visual Arts, University of East Anglia, Norwich, England, 1974–95. Author of Gothic Art.*

ARCHITECTURE, THE HISTORY OF WESTERN (in part)

PAINTING, THE HISTORY OF WESTERN (in part)

SCULPTURE, THE HISTORY OF WESTERN (in part)

A.M.B. **Alfred M. Beeton.** *Director, Great Lakes Environmental Research Laboratory, National Oceanic and Atmospheric Administration, Ann Arbor, Michigan. Adjunct Professor, School of Public Health, University of Michigan, Ann Arbor. Author of numerous scientific articles on the Great Lakes.*

NORTH AMERICA (in part)

A.M.-C. **Arturo Morales-Carrión** (d. 1989). *Executive Director, Puerto Rican Endowment for the Humanities, San Juan, 1977–89. Author of Puerto Rico: A Political and Cultural History and others.*
WEST INDIES, THE (in part)

A.M.C.L. **Agnes M.C. Latham.** *Former Reader in English, Bedford College, University of London. Editor of The Poems of Sir Walter Raleigh and others.*
RALEIGH, SIR WALTER (Micropædia)

A.M.C.S. **A.M. Celâl Şengör.** *Associate Professor of Geology, Technical University of Istanbul. Author of The Cimmeride Orogenic System and the Tectonics of Eurasia.*

ASIA (in part)

A.M.-D. **Angeliki Malikouti-Drachman.** *Lector, Department of Linguistics, University of Salzburg, Austria. Author of Metaschematistike morphologia tou neoellenikou onomatos: diatribe epi didaktoria.*

LANGUAGES OF THE WORLD (in part)

A.Me. **Assefa Mehretu.** *Professor of Geography, Michigan State University, East Lansing. Author of Regional Disparity in Sub-Saharan Africa.*
EASTERN AFRICA (in part)

A.M.Ga. **Aleksandr Mikhaylovich Gavrillov.** *Former Senior Scientist, Leningrad Hydrological Institute.*
EUROPE (in part)

A.M.G.-G. **Angel M. García-Gómez.** *Professor and Head, Department of Spanish and Latin-American Studies, University College, University of London. Author of The Legend of the Laughing Philosopher and Its Presence in Spanish Literature, 1500–1700 and others.*

SPANISH LITERATURE (in part)

A.Mi. **Arthur Mizener** (d. 1988). *Mellon Foundation Professor of Humanities, Cornell University, Ithaca, New York. Author of The Far Side of Paradise: A Biography of F. Scott Fitzgerald and others.*
FITZGERALD, F. SCOTT (Micropædia)

A.Mi.No. **A. Michael Noll.** *Professor, Annenberg School for Communication, University of Southern California, Los Angeles. Author of Highway of Dreams: A Critical Appraisal of the Communication Superhighway.*

BROADCASTING (in part)

A.M.K. **Albert M. Kudo.** *Professor of Geology, University of New Mexico, Albuquerque.*

MINERALS AND ROCKS (in part)

A.M.N. **Alois M. Nagler** (d. 1993). *Henry McCormick Professor of Dramatic History and Criticism, Yale University, 1965–76. Author of Sources of Theatrical History and others.*

BERNHARDT, SARAH (Micropædia)

DUSE, ELEONORA (in part) (Micropædia)

A.Mo. **Alberto Monroy, M.D.** (d. 1986). *Director, Zoological Station, Naples. Author of Chemistry and Physiology of Fertilization.*

REPRODUCTION AND REPRODUCTIVE SYSTEMS (in part)

A.Moz. **Asokendu Mozumder.** *Faculty Fellow, Radiation Laboratory and Department of Chemistry, University of Notre Dame, Indiana. Coauthor of Advances in Radiation Chemistry.*

RADIATION (in part)

A.M.Q. **Anthony M. Quinton, Baron Quinton.** *Chairman, British Library Board, 1985–90. President, Trinity College, Oxford, 1978–87; Lecturer in Philosophy, University of Oxford, 1950–78. Author of The Nature of Things.*

BACON, FRANCIS (in part)

PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (in part)

A.M.R. **Aleksandr Maximovich Ryabchikov.** *Professor of Geography; Head, Laboratory of Natural Resources, Moscow M.V. Lomonosov State University. Author of The Changing Face of the Earth.*

ASIA (in part)

A.M.W. **A.M. Winchester.** *Emeritus Professor of Biology, University of Northern Colorado, Greeley. Author of Genetics and others.*

BIOLOGICAL SCIENCES, THE (in part)

GENETICS AND HEREDITY, THE PRINCIPLES OF (in part)

A.N. **Alvin Novick.** *Professor of Biology, Yale University. Researcher on the biology of bats. Coauthor of The World of Bats.*

MAMMALS (in part)

A.Na. **Arata Naka.** *Former Professor of Japanese History of Education, University of Tokyo. Author of The Formation of the Modern Textbook System.*

EDUCATION, HISTORY OF (in part)

A.N.A. **Antony Nicolas Allott.** *Professor of African and Comparative Law, University of Buckingham, England. Emeritus Professor of African Law, School of Oriental and African Studies, University of London. Author of New Essays in African Law and others.*

CRIME AND PUNISHMENT (in part)

An.A.A. **Anwar Abdel Aleem.** *Professor of Biological Oceanography; Chairman, Department of Oceanography, University of Alexandria, Egypt.*

INDIAN OCEAN, THE (in part)

An.B. **Anthony Burgess** (d. 1993). *Novelist and critic. Author of A Clockwork Orange; The Novel Now; Urgent Copy.*

LITERATURE, THE ART OF (in part)

An.C.B. **Andrew C. Brix.** *First Secretary, International Bureau of the Universal Postal Union, Berne, Switzerland.*

POSTAL SYSTEMS (in part)

A.Ne. **Andries Nel.** *Professor of Geography, University of Stellenbosch, South Africa. Author of Stad en dorp; Die warm Reënstreke.*

SOUTHERN AFRICA (in part)

A.N.G. **Alan N. Gent.** *Dr. Harold A. Morton Professor Emeritus of Polymer Physics and Polymer Engineering, University of Akron, Ohio. Coeditor of Engineering With Rubber: How to Design Rubber Components.*

INDUSTRIAL POLYMERS (in part)

A.N.J. **Alexander Norman Jeffares.** *Emeritus Professor of English, University of Stirling, Scotland. Author of W.B. Yeats: A New Biography and others; editor of Selected Poems and Prose: Whitman.*

WHITMAN, WALT (in part) (Micropædia)

A.N.K. **Aleksey Nilovich Kosarev.** *Professor of Oceanology, Moscow M.V. Lomonosov State University. Author of Hydrology of the Caspian and Aral Seas.*

ASIA (in part)

ATLANTIC OCEAN, THE (in part)

An.L. **Antonino Lombardo** (d. 1985). *Inspector General of National Archives, Rome. Professor of the Study of Archives, University of Rome. Coauthor of Documenti del commercio veneziano nei secoli XI–XIII.*

DANDOLO, ENRICO (Micropædia)

A.N.L.W. **Arthur N.L. Wina** (d. 1995). *Chairman, National Party of Zambia. Member of Parliament, 1962–68, 1973–78, and 1992; Minister of Finance, 1963–67; Minister of Education, 1967–68 and 1992–94, Government of Zambia (formerly Northern Rhodesia).*

AFRICA (in part)

A.No. **Alexander Nove** (d. 1994). *Professor of Economics, University of Glasgow, Scotland, 1963–82. Author of An Economic History of the U.S.S.R.*

ECONOMIC GROWTH AND PLANNING (in part)

An.Pa. **Angel Palerm** (d. 1980). *Director, Institute of Social Sciences, Universidad Iberoamericana, Mexico City.*

MEXICO (in part)

A.N.R.N. **Alastair N.R. Niven.** *Director of Literature, Arts Council of England, London. Author of D.H. Lawrence: The Novels; editor of The Commonwealth Writer Overseas.*

AFRICAN ARTS (in part)

A.N.R.R. **Arthur Napoleon Raymond Robinson.** *Prime Minister of Trinidad and Tobago, 1986–91. Author of The Mechanics of Independence: Patterns of*

Political and Economic Transformation in Trinidad and Tobago.

WEST INDIES, THE (in part)

An.S. **Ailon Shiloh.** *Professor and Director of Graduate Studies, Department of Anthropology, University of South Florida, Tampa. Editor of Peoples and Cultures of the Middle East.*

ASIAN PEOPLES AND CULTURES (in part)

An.Sc. **Annemarie Schimmel.** *Former Professor of Indo-Muslim Culture, Harvard University. Author of Gabriel's Wing; Islamic Calligraphy; and others.*

ISLĀM, MUHAMMAD AND THE RELIGION OF (in part)

ISLĀMIC ARTS (in part)

JALĀL AD-DIN AR-RŪMĪ (Micropædia)

A.N.W. **Alfred North Whitehead** (d. 1947). *Professor of Philosophy, Harvard University, 1924–36. Author of Process and Reality and many others.*

PHILOSOPHIES OF THE BRANCHES OF KNOWLEDGE (in part)

A.N.Y. **A.N. Yiannopoulos.** *Eason-Weinmann Professor of Law, Tulane University, New Orleans. Author of Civil Law Property and others.*

TRANSPORTATION LAW (in part)

A.O. **Anthony Oldcorn.** *Chair, Italian Studies, Brown University, Providence, Rhode Island. Italian Field Editor, Twayne World Authors Series. Coeditor of Lectura Dantis: Inferno; translator of Jewish Life in Renaissance Italy.*

ITALIAN LITERATURE (in part)

A.O.H.III. **Alfred O. Hero, III.** *Associate Professor of Electrical Engineering and Computer Science, University of Michigan, Ann Arbor.*

TELECOMMUNICATIONS SYSTEMS (in part)

A.O.J.C. **A.O.J. Cockshut.** *G.M. Young Lecturer in 19th-Century English Literature, University of Oxford; Fellow of Hertford College, Oxford. Author of The Achievement of Walter Scott; Anglican Attitudes: A Study of Victorian Religious Controversies; and others.*

CARLYLE, THOMAS (Micropædia)

A.O.K. **Anne O. Krueger.** *Professor of Economics, Stanford University, California. Author of Exchange Rate Determination.*

ECONOMIC GROWTH AND PLANNING (in part)

A.P. **Aleksander Poznansky.** *Librarian, Slavic and Eastern European Collection, Yale University. Author of Tchaikovsky; editor of Tchaikovsky Through Others' Eyes.*

TCHAIKOVSKY, PETER ILICH (Micropædia)

A.Pa. **André Parrot** (d. 1980). *Archaeologist. Director of the Louvre, Paris, 1968–72. Member of the Institute of France. Author of Abraham and His Times and others.*

ABRAHAM (Micropædia)

A.P.D. **Anatoly Petrovich Domanitsky.** *Former Senior Scientist, Leningrad Hydrological Institute.*

EUROPE (in part)

A.P.F. **Alfred P. Fishman, M.D.** *William Maul Measey Professor Emeritus of*

Medicine, University of Pennsylvania, Philadelphia. Editor of Handbook of Physiology, sect. 3, The Respiratory System and others.

RESPIRATION AND RESPIRATORY SYSTEMS (in part)

A.P.G. **Alberto Passos Guimarães** (d. 1993). *Geography Editor, Enciclopédia Mirador Internacional, Rio de Janeiro. RIO DE JANEIRO (in part)*

A.P.I. **Andrew P. Ingersoll.** *Professor of Planetary Science, California Institute of Technology, Pasadena. Member of the Voyager Imaging Team. Coauthor of The New Solar System.*

SOLAR SYSTEM, THE (in part)

A.P.L. **Aleksandr Petrovich Lisitsin.** *Former Head, Laboratory of Physical Methods of Research, Institute of Oceanology, Academy of Sciences of the U.S.S.R., Moscow. Author of Processes of Recent Sedimentation in the Bering Sea; Sedimentation in the World Ocean; and others.*

PACIFIC OCEAN, THE (in part)

A.P.M. **Aleksandr Pavlovich Muranov.** *Former Senior Scientist, Leningrad Hydrological Institute. Author of Velichayshiye reki mira. ASIA (in part)*

A.P.Ma. **A.P. Martinich.** *Professor of Philosophy, University of Texas at Austin. Author of Philosophical Writing. EPISTEMOLOGY (in part)*

A.R. **Alan Ryalls.** *Editor, Camping and Caravanning magazine, Camping Club of Great Britain and Ireland, 1956–75. Author of Modern Camping and others. CAMPING (Micropædia)*

A.R.A. **Amir R. Amir.** *Management Consultant, McKinsey & Company, Inc., Miami, Florida. INDUSTRIES, MANUFACTURING (in part)*

Ar.B. **Arnaldo Bruschi.** *Professor of the History of Architecture, University of Rome. Author of Bramante architetto. BRAMANTE, DONATO (Micropædia)*

A.R.B. **A. Richard Baldwin.** *Vice President and Executive Director of Research, Cargill, Inc., Minneapolis, Minnesota, 1964–83. Former Editor, Journal of the American Oil Chemists' Society. FOOD PROCESSING (in part)*

Ar.Br. **Sir Arthur Bryant** (d. 1985). *Author of Samuel Pepys and many others. PEPYS, SAMUEL (Micropædia)*

A.R.Bu. **Andrew Robert Burn** (d. 1991). *Visiting Professor, A College Year in Athens, Inc., 1969–72. Reader in Ancient History, University of Glasgow, 1965–69. Author of Persia and the Greeks and others. THEMISTOCLES (Micropædia)*

A.R.C. **A. Robert Caponigri** (d. 1983). *Professor of Philosophy, University of Notre Dame, Indiana. Author of History and Liberty: The Historical Writings of Benedetto Croce. CROCE, BENEDETTO (Micropædia)*

Ar.D. **Arthur J.M. Doucy.** *Professor of Social Economics; former Director,*

Institute of Sociology, Free University of Brussels. Author of Traité d'économie sociale.

BELGIUM (in part)

Ar.H. **Rabbi Arthur Hertzberg.** *Emeritus Professor of Religion, Dartmouth College, Hanover, New Hampshire. Author of The Jews in America and others.*

JUDAISM (in part)

A.-R.H. **Abdul-Rahman Hamidé.** *Professor of Geography, Damascus University. Author of La Région d'Alep and others.*

SYRIA (in part)

Ar.Hü. **Arthur Hübscher.** *Former Director, Schopenhauer Archives, Frankfurt. Senior President, International Schopenhauer Society, Frankfurt. Author of many books on Schopenhauer and editor of his works.*

SCHOPENHAUER, ARTHUR (in part)
(Micropædia)

A.Ri. **Alan Rich.** *Music Critic, Daily Variety and L.A. Weekly. Author of Music: Mirror of the Arts and others.*

MUSIC, THE ART OF (in part)

A.R.K. **Alan Roy Katritzky.** *Kenan Professor of Organic Chemistry, University of Florida, Gainesville. Editor of Advances in Heterocyclic Chemistry.*

CHEMICAL COMPOUNDS (in part)

A.R.Ki. **Albert Roland Kiralfy.** *Emeritus Professor of Law, King's College, University of London. Author of The English Legal System.*

LEGAL SYSTEMS, THE EVOLUTION OF MODERN WESTERN (in part)

Ar.Kn. **Arthur Kelman.** *Emeritus Professor of Plant Pathology and Bacteriology, University of Wisconsin, Madison. University Distinguished Scholar in Plant Pathology, North Carolina State University, Raleigh. Editor of Sourcebook of Exercises in Plant Pathology. DISEASE (in part)*

Ar.L.S. **Arthur L. Schawlow.** *Professor of Physics, Stanford University, California. Cowinner, Nobel Prize for Physics, 1981, for the development of laser spectroscopy. MASER (in part) (Micropædia)*

Ar.M. **Arthur Mitzman.** *Professor of History, University of Amsterdam. Author of The Iron Cage: An Historical Interpretation of Max Weber. WEBER, MAX (in part) (Micropædia)*

A.R.M. **Alexander Reginald Myers** (d. 1980). *Professor of Medieval History, University of Liverpool, England, 1967–80. Author of The Household of Edward IV. EDWARD IV (ENGLAND AND GREAT BRITAIN) (Micropædia)*

HENRY VII (ENGLAND) (in part)
(Micropædia)

A.R.Mi. **Allan R. Millett.** *Mason Professor of Military History, Ohio State University, Columbus. Author of Semper Fidelis: The History of the United States Marine Corps and others.*

KOREAN WAR

A.Ro. **Anne L. Rosenthal.** *Art conservator in private practice.*

ART CONSERVATION AND RESTORATION (in part)

Ar.R. **Arthur Robinson, M.D.** *Professor of Biochemistry, Biophysics, and Genetics and of Pediatrics, University of Colorado, Denver. Senior staff member, National Jewish Center for Immunology and Respiratory Medicine, Denver.*

GENETICS AND HEREDITY, THE PRINCIPLES OF (in part)

A.R.R. **Allien R. Russon.** *Emeritus Professor of Management, College of Business, University of Utah, Salt Lake City. Author of Methods of Teaching Shorthand. WRITING (in part)*

A.R.S. **Alarich R. Schultz.** *Professor of Botany, Federal University of Rio Grande do Sul, Porto Alegre, Brazil. Author of Estudo Prático da Botânica Geral. SOUTH AMERICA (in part)*

Ar.Sp. **Arnold Spekke** (d. 1972). *Author of History of Latvia and others. BALTIC STATES (in part)*

A.R.T. **Archie Rule Turnbull.** *Chief Executive, Edinburgh University Press. Editor of The Making of Classical Edinburgh. EDINBURGH (in part)*

A.R.W. **Almon Robert Wright.** *Senior Historian, U.S. Department of State, Washington, D.C., 1958–66. Coeditor of Foreign Relations: The American Republics, 1941–48. CENTRAL AMERICA (in part)*

A.Ry. **Alan Ryan.** *Warden of New College, University of Oxford. Author of Liberal Anxieties and Liberal Education. SOCIO-ECONOMIC DOCTRINES AND REFORM MOVEMENTS, MODERN (in part)*

A.S.A. **Ass'ad Sulaiman Abdo.** *Professor and Chairman, Department of Geography, King Saud University, Riyadh, Saudi Arabia. President, Saudi Geographical Society. Author of Land and Air Transport in Saudi Arabia and others. MECCA AND MEDINA (in part)*

As.B. **Asa Briggs, Baron Briggs.** *Provost of Worcester College, University of Oxford, 1976–91. Author of The Age of Improvement, 1783–1867 and others. COBDEN, RICHARD (Micropædia) UNITED KINGDOM (in part)*

A.Sc. **Aaron Scharf** (d. 1993). *Professor of Art History, Open University, Milton Keynes, England, 1969–82. Author of Art and Photography; Pioneers of Photography. CARTIER-BRESSON, HENRI (Micropædia)*

A.S.Cu. **Alan S. Curtis.** *Professor of Music, University of California, Berkeley. Author of Sweelinck's Keyboard Music. RAMEAU, JEAN-PHILIPPE (Micropædia)*

A.S.D. **A.S. Davidsohn** (deceased). *Consulting chemist. Coauthor of Soap Manufacture; Synthetic Detergents. INDUSTRIES, CHEMICAL PROCESS (in part)*

A.Se. **Amulya Chandra Sen.** *Former Editor, The Indo-Asian Culture. Author of Asoka's Edicts and others. ASOKA (Micropædia)*

As.F. Astrid Friis (d. 1966). *Professor of History, University of Copenhagen.*
DENMARK (in part)

A.S.F. Angus Stewart Fletcher. *Distinguished Professor of English and Comparative Literature, City University of New York. Author of Allegory: The Theory of a Symbolic Mode and others.*
LITERATURE, THE ART OF (in part)

A.Sg. Alfred Steinberg (d. 1995). *Writer and historian. Author of Man from Missouri: The Life and Times of Harry S. Truman and others.*
TRUMAN, HARRY S. (Micropædia)

A.S.G. Arthur S. Gelston, Jr. *Former Assistant in History, University of California, Berkeley.*
BRAZIL (in part)

A.Sh. Amnon Shiloah. *Professor of Musicology, Hebrew University of Jerusalem. Author of The Theory of Music in Arabic Writings and others.*
ISLAMIC ARTS (in part)

A.S.K. Arvid S. Kapelrud. *Professor of Old Testament, University of Oslo. Author of Israel.*
AARON (Micropædia)

A.S.L. Arthur S. Link. *George H. Davis '86 Professor Emeritus of American History, Princeton University. Editor, The Papers of Woodrow Wilson, 1958-92. Author of The Growth of American Democracy: An Interpretive History and many others.*
UNITED STATES OF AMERICA (in part)

A.Sm. Audrey Smedley. *Professor of Anthropology, Virginia Commonwealth University. Author of Race in North America: Origin and Evolution of a Worldview.*
AFRICA (in part)
RACE
RACISM (Micropædia)

A.S.Ma. Alan S. Mabin. *Associate Professor of Urban Planning, University of the Witwatersrand, Johannesburg, South Africa. Editor of Organisation and Economic Change and others.*
SOUTHERN AFRICA (in part)

A.So. Angelo Solmi. *Film critic, Oggi (weekly literary periodical). Former Managing Editor, Rizzoli Editore, Milan. Author of Storia di Federico Fellini and others.*
FELLINI, FEDERICO (in part) (Micropædia)

A.S.R. Alfred S. Romer (d. 1973). *Alexander Agassiz Professor of Zoology, Harvard University, 1947-65.*
SIMPSON, GEORGE GAYLORD (Micropædia)

A.St. Anthony Standen (d. 1993). *Executive Editor, Kirk-Othmer Encyclopedia of Chemical Technology, New York City, 1963-70. Author of Science Is a Sacred Cow.*
INDUSTRIES, CHEMICAL PROCESS (in part)

A.S.T. A. Stewart Truswell. *Boden Professor Emeritus of Human Nutrition, University of Sydney. Author of ABC of Nutrition.*
NUTRITION (in part)

A.Su. Alexander Sutulov (d. 1991). *President, Internet Publications, Santiago, Chile. Author of Molybdenum Extractive Metallurgy; Molybdenum and Rhenium; editor of International Molybdenum Encyclopaedia, 1778-1978 (3 vol.).*
INDUSTRIES, EXTRACTION AND PROCESSING (in part)

A.Sw. Alfred Swenson. *Associate Professor of Architecture, Illinois Institute of Technology, Chicago. Partner, Alfred Swenson Pao-Chi Chang Architects, Chicago.*
BUILDING CONSTRUCTION (in part)

A.Ta. Allen Tate (d. 1979). *Poet and critic. Regents' Professor of English, University of Minnesota, Minneapolis, 1966-68. Editor of T.S. Eliot: The Man and His Work, A Critical Evaluation by Twenty-six Distinguished Writers.*
ELIOT, T.S. (in part) (Micropædia)

A.T.G. Alfred Thomas Grove. *Emeritus Fellow of Downing College, Cambridge; former Director, Centre of African Studies, University of Cambridge. Author of Geography of Changing Africa and others.*
WESTERN AFRICA (in part)

A.T.T. Alan T. Thomas. *Technical Consultant, Distilled Spirits Council of the United States. Former Technical Director, Brown-Forman Corporation, Louisville, Kentucky.*
BEVERAGE PRODUCTION (in part)

A.T.v.M. Arthur Taylor von Mehren. *Story Professor Emeritus of Law, Harvard University. Author of The Civil Law System.*
BUSINESS LAW (in part)

A.U. Arne Unhjem (deceased). *Professor of Philosophy, Wagner College, Staten Island, New York. Author of Dynamics of Doubt: A Preface to Tillich.*
TILICH, PAUL (Micropædia)

Au.L.R. Austin L. Rand (d. 1982). *Research Associate, Archbold Biological Station, Lake Placid, Florida. Chief Curator of Zoology, Field Museum of Natural History, Chicago, 1955-70. Author of Ornithology: An Introduction.*
BIRDS (in part)

A.V.A. Arkady Vladimirovich Alekseev. *Vice President, Far Eastern Division, Russian Academy of Sciences, Vladivostok; former Chief Deputy Director, Pacific Oceanology Institute.*
PACIFIC OCEAN, THE (in part)

A.v.B. Andres R.F.T. von Brandt. *Emeritus Professor of Fish Catching Techniques, University of Hamburg. Director, Institute for Fish Catching Techniques, Ministry for Food and Agriculture, Hamburg, 1936-71. Author of Fish Catching Methods of the World.*
FISHING, COMMERCIAL (in part)

A.V.D. A. Vibert Douglas (d. 1988). *Professor of Astronomy, Queen's University at Kingston, Ontario, 1943-63. Author of Arthur Stanley Eddington.*
EDDINGTON, SIR ARTHUR STANLEY (Micropædia)

A.V.H. Albert Van Helden. *Lynette S. Autrey Professor of History, Rice*

University, Houston, Texas. Author of Measuring the Universe: Cosmic Dimensions from Aristarchus to Halley.
GALILEO

A.Vo. Arthur Voyce. *Historian of Russian art and architecture. Author of The Art and Architecture of Medieval Russia and others.*

ARCHITECTURE, THE HISTORY OF WESTERN (in part)

PAINTING, THE HISTORY OF WESTERN (in part)

SCULPTURE, THE HISTORY OF WESTERN (in part)

Av.S. Avrum Stroll. *Research Professor of Philosophy, University of California, San Diego, at La Jolla. Author of Twentieth-Century Analytic Philosophy.*
ANALYTIC PHILOSOPHY (Micropædia)
EPISTEMOLOGY (in part)
PHILOSOPHY, THE HISTORY OF WESTERN (in part)

A.W. Alan Walker. *Professor of Music, McMaster University, Hamilton, Ontario. Author of An Anatomy of Musical Criticism and others.*
MUSIC, THE ART OF (in part)

A.Wa. Andrew Warren. *Senior Lecturer in Geography, University College, University of London.*
CONTINENTAL LANDFORMS (in part)

A.W.C. Alan William Cuthbert. *Sheild Professor of Pharmacology, University of Cambridge.*
DRUGS AND DRUG ACTION (in part)

A.We. Albert Wendt. *Professor of English, University of Auckland, New Zealand. Author of Leaves of the Banyan Tree and others.*
PACIFIC ISLANDS (in part)

A.W.G. Alan William Gentry. *Former Principal Scientific Officer, Department of Palaeontology, Natural History Museum, London. Author of numerous research papers on Old World hoofed mammals.*
MAMMALS (in part)

A.W.Ge. Arnold Wycombe Gomme (d. 1959). *Professor of Greek, University of Glasgow, Scotland, 1946-57. Author of A Historical Commentary on Thucydides (vol. 1-3); Greece; and others.*
THUCYDIDES (Micropædia)

A.W.Gr. Alic William Gray (d. 1981). *Head, Agricultural Advisory and Development Section, Electricity Council, London, 1966-70. Principal Assistant, 1948-65.*
AGRICULTURE, THE HISTORY OF (in part)

A.Wh. Alwyne Wheeler. *Former Principal Scientific Officer, Fish Section, Zoology Department, British Museum (Natural History), London. Author of Fishes of the World and others.*
FISHES (in part)

A.W.H.A. A.W.H. Adkins. *Edward Olson Professor of Greek, of Philosophy, and of New Testament and Early Christian Literature, University of Chicago. Author of Merit and Responsibility: A Study in Ancient Greek Values and others.*
EUROPEAN RELIGIONS, ANCIENT (in part)

A.W.J. A. Walter James. *Principal, St. Catharine's, Windsor, England, 1974–82. Editor, The Times (London) Educational Supplement, 1952–69. Author of The Christian in Politics.*

ACTON, JOHN EMERICH EDWARD DALBERG
ACTON, 1ST BARON (*in part*)
 (Micropædia)

A.W.L. Albert William Levi (d. 1988). *David May Distinguished University Professor of Humanities, Washington University, St. Louis, Missouri, 1952–79. Author of Philosophy and the Modern World.*

PHILOSOPHY, THE HISTORY OF WESTERN
 (*in part*)

A.W.M. Anne Wood Murray. *Emeritus Curator of American Costume, Division of Costume, Department of Social and Cultural History, National Museum of American History, Smithsonian Institution, Washington, D.C.*

DRESS AND ADORNMENT (*in part*)

A.Wo. Albert Wolfson. *Professor of Biological Sciences, Northwestern University, Evanston, Illinois.*

BEHAVIOUR, ANIMAL (*in part*)

A.W.P. Alois Wilhelm Podhajsky (d. 1973). *Director, Spanish Riding School of Vienna, 1939–64. Winner, Olympic Bronze Medal for Dressage (equestrian event), 1936. Author of The Complete Training of Horse and Rider and others.*

HORSES AND HORSEMANSHIP (*in part*)

A.W.Po. Alan W. Powell. *Professor of History, Northern Territory University, Casuarina, Australia. Author of Far Country: A Short History of the Northern Territory; The Shadow's Edge: Australia's Northern War; and others.*

AUSTRALIA (*in part*)

A.W.R. Alan W. Richards. *Former Development Manager, Imperial Smelting Processes Ltd., Bristol, England. Author of articles on zinc smelting and zinc metallurgy.*

INDUSTRIES, EXTRACTION AND PROCESSING
 (*in part*)

A.W.Re. Allen Walker Read. *Emeritus Professor of English, Columbia University. Author of "Approaches to Lexicography and Semantics" in Current Trends in Linguistics.*

ENCYCLOPEDIAS AND DICTIONARIES
 (*in part*)

A.W.S. Albert Wilbur Schlechten (d. 1984). *Director, W.J. Kroll Institute for Extractive Metallurgy, Colorado School of Mines, Golden.*

INDUSTRIES, EXTRACTION AND PROCESSING
 (*in part*)

A.W.Sc. Alan W. Scaroni. *Professor of Fuel Science; Director, Energy and Fuels Research Center, Pennsylvania State University, University Park. Coauthor of Evaluation of Sorbent Performance in Fluidized Bed Combustion.*

INDUSTRIES, EXTRACTION AND PROCESSING
 (*in part*)

A.Y. Atsuhiko Yoshida. *Professor of Comparative Mythology, Gakushuin*

University, Tokyo. Author of Origins of Japanese Myths and others.

LITERATURE, THE ART OF (*in part*)

A.Zy. Antoni Zygmund (d. 1992). *Gustavus F. and Anne M. Swift Distinguished Service Professor of Mathematics, University of Chicago, 1967–82. World authority on Fourier analysis. Author of Trigonometric Series; coauthor of Analytic Functions.*

ANALYSIS (IN MATHEMATICS) (*in part*)

B. Robert Norman William Blake, Baron Blake. *Provost, Queen's College, University of Oxford, 1968–87. Author of The Conservative Party from Peel to Thatcher and others.*

ASQUITH, H.H., 1ST EARL OF OXFORD AND ASQUITH (Micropædia)

DISRAELI, BENJAMIN, EARL OF BEACONSFIELD
 (*in part*) (Micropædia)

LLOYD GEORGE, DAVID (Micropædia)

B.A. Bruno Accordi (d. 1986). *Director, Geology and Paleontology Institute, University of Rome. Author of numerous publications on geology.*

EUROPE (*in part*)

B.A.B. Bruce A. Bolt. *Emeritus Professor of Seismology, University of California, Berkeley. Author of Earthquakes: A Primer and others.*

EARTHQUAKES

B.A.C. Bruce Alan Carr. *Community Services Librarian, Public Library of Des Moines, Iowa. Former Music Administrator, Pittsburgh Symphony Orchestra.*

MUSIC, THE ART OF (*in part*)

B.A.D. Boyce A. Drummond, Jr. *Emeritus Professor of History, Henderson State University, Arkadelphia, Arkansas. Author of Arkansas, Politics and Government.*

UNITED STATES OF AMERICA (*in part*)

B.A.F. Boris Aleksandrovich Fedorovich (d. 1981). *Senior Scientist, Institute of Geography, Academy of Sciences of the U.S.S.R., Moscow.*

ASIA (*in part*)

B.A.J. Benjamin A. Jones, Jr. *Emeritus Professor of Agricultural Engineering, University of Illinois at Urbana-Champaign. Coauthor of Engineering Applications in Agriculture.*

FARMING AND AGRICULTURAL TECHNOLOGY
 (*in part*)

B.Am. Barthélemy Amengual. *Former Editor, Études Cinématographiques. Author of René Clair; Clés pour le cinéma.*

CLAIR, RENÉ (Micropædia)

B.A.M. Boyd A. Martin. *Director, Boyd and Grace Martin Peace Institute; Distinguished Borah Professor Emeritus of Political Science; Emeritus Director, Bureau of Public Affairs Research, University of Idaho, Moscow. Author of Idaho Voting Trends and others.*

UNITED STATES OF AMERICA (*in part*)

B.Ar. Benno Artmann. *Professor Emeritus of Mathematics at the University of Göttingen, Germany. Author of Euclid: The Creation of Mathematics.*

GEOMETRY (*in part*)

B.As. Bernard Ashmole (d. 1988). *Lincoln Professor of Classical Archaeology and Art, University of Oxford, 1956–61.*

PAINTING, THE HISTORY OF WESTERN
 (*in part*)

SCULPTURE, THE HISTORY OF WESTERN
 (*in part*)

B.A.-S. Brian Abel-Smith (d. 1996). *Professor of Social Administration, London School of Economics and Political Science, University of London, 1965–91. Author of The Poor and the Poorest and others.*

SOCIAL WELFARE (*in part*)

B.A.St. Barbara A. Standley. *Freelance editor. Former Associate Editor, Encyclopædia Britannica, Chicago.*

INDIA (*in part*)

B.B. Bela Balassa (d. 1991). *Professor of Political Economy, Johns Hopkins University, Baltimore, Maryland. Consultant, International Bank for Reconstruction and Development. Author of Trade Liberalization Among Industrial Countries: Objectives and Alternatives and others.*

INTERNATIONAL TRADE (*in part*)

B.B.C. Betty Boyd Caroli. *Author of The Roosevelt Women; First Ladies; Inside the White House: America's Most Famous Home; and others.*

ADAMS, ABIGAIL (Micropædia)

ADAMS, LOUISA (Micropædia)

CLINTON, HILLARY (Micropædia)

ONASSIS, JACQUELINE KENNEDY
 (Micropædia)

UNITED STATES PRESIDENCY AND FIRST LADY
 (*in part*)

B.B.De. Barbara B. Decker. *Coauthor of Volcanoes.*

VOLCANISM (*in part*)

B.Be. Bernard Beckerman (d. 1985). *Brander Matthews Professor of Dramatic Literature, Columbia University, 1977–85. President, American Society for Theatre Research, 1973–79. Author of Shakespeare at the Globe; Dynamics of Drama; and others.*

THEATRICAL PRODUCTION (*in part*)

B.B.G. Bentley Brinkerhoff Gilbert. *Professor and Chairman, Department of History, University of Illinois at Chicago. Author of David Lloyd George: A Political Life and others.*

UNITED KINGDOM (*in part*)

B.Bl. Brand Blanshard (d. 1987). *Professor of Philosophy, Yale University, 1945–61. Author of The Nature of Thought; Reason and Analysis.*

PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (*in part*)

B.Ble. Brebis Bleaney. *Dr. Lee's Professor Emeritus of Experimental Philosophy, University of Oxford. Coauthor of Electricity and Magnetism and others.*

ELECTRICITY AND MAGNETISM (*in part*)

B.Bo. Baruch Boxer. *Professor of Geography and Environmental Sciences, Cook College, Rutgers University, New Brunswick, New Jersey. Author of "China's Environmental Prospects" in Asian Survey and other articles.*

ATLANTIC OCEAN, THE (*in part*)

CHINA (*in part*)

SHANGHAI

TIENTSIN

B.Br. Barbara Buckmaster (the Hon. Mrs. Barbara Miller) (d. 1966). *Writer on Balkan affairs. Member of the staff, Foreign Research and Press Service, Royal Institute of International Affairs, London.*

BALKAN STATES (*in part*)

B.C. Bruce Cole. *Distinguished Professor of Fine Arts, Indiana University, Bloomington. Author of Masaccio and the Art of Early Renaissance Florence and many others.*

MASACCIO (Micropædia)

B.C.B. Barry C. Bishop (d. 1994). *Chairman, Committee for Research and Exploration, National Geographic Society, Washington, D.C., 1989–91. Author of Karnali Under Stress.*

ASIA (*in part*)

B.Ch. Brian Chapman (d. 1981). *Professor of Government, Victoria University of Manchester, England, 1961–81. Author of The Profession of Government and others.*

PUBLIC ADMINISTRATION (*in part*)

B.C.H. Bruce C. Heezen (d. 1977). *Associate Professor of Geology, Lamont-Doherty Geological Observatory, Columbia University, Palisades, New York, 1964–77. Coauthor of The Floors of the Oceans.*

ATLANTIC OCEAN, THE (*in part*)

B.Cr. Bosley Crowther (d. 1981). *Creative consultant, Columbia Pictures, New York City, 1968–73. Screen critic and editor, The New York Times, 1940–68. Author of The Great Films: Fifty Golden Years of Motion Pictures.*

DISNEY, WALT (*in part*) (Micropædia)

B.C.Ri. Bonham C. Richardson. *Professor of Geography, Virginia Polytechnic Institute and State University. Author of Caribbean Migrants and others.*

GUYANA (*in part*)

B.C.S. B. Charlotte Schreiber. *Emeritus Professor of Geology, Queens College, City University of New York, Flushing. Coeditor of Sedimentology, "Earth Science Series."*

INDIAN OCEAN, THE (*in part*)

B.C.So. Brian C. Southam. *Publisher, Athlone Press, London. Author of Jane Austen's Literary Manuscripts; Tennyson; and others.*

AUSTEN, JANE (Micropædia)

B.D.H. Baxter D. Honeycutt. *Manager, Exploration Support, ARCO Oil and Gas Company, Dallas, Texas.*

ENGINEERING (*in part*)

B.Di. Bern Dibner (d. 1988). *Historian of science and technology. Founder and Director, Burndy Library, Norwalk, Connecticut, 1935–88. Author of Heralds of Science.*

GALVANI, LUIGI (Micropædia)

B.E. Blake Ehrlich (d. 1974). *Freelance writer. Author of Paris on the Seine; London on the Thames.*

ATHENS (*in part*)

DUBLIN (*in part*)

EDINBURGH (*in part*)

FLORENCE (*in part*)

ISTANBUL

LISBON (*in part*)

LONDON (*in part*)

MADRID (*in part*)

MARSEILLE (*in part*)

PARIS (*in part*)

ROME (*in part*)

VIENNA (*in part*)

Be.J. Bernard Jaffe (d. 1986). *Freelance science writer. Chairman, Science Department, James Madison High School, Brooklyn, New York, 1944–58. Author of Men of Science in America and others.*

FERMI, ENRICO (Micropædia)

Be.M. Bernd Magnus. *Professor of Philosophy; Director, Center for Ideas and Society, University of California, Riverside. Author of Nietzsche's Existential Imperative and others.*

NIETZSCHE

B.E.M. Bernard E. Meland (d. 1993). *Professor of Constructive Theology, University of Chicago, 1945–64. Author of The Realities of Faith and others.*

OTTO, RUDOLF (*in part*) (Micropædia)

B.E.Ma. Bernard Edward Matthews. *Lecturer in Zoology, University of Edinburgh. Coauthor of Biology of Nematodes.*

CIRCULATION AND CIRCULATORY SYSTEMS (*in part*)

B.E.McK. Brian E. McKnight. *Professor and Head, Department of East Asian Studies, University of Arizona, Tucson. Author of Village and Bureaucracy in Southern Sung China and others.*

CHINA (*in part*)

Be.N. Beaumont Newhall (d. 1993). *Visiting Professor of Art, University of New Mexico, Albuquerque, 1971–84. Director, George Eastman House, Rochester, New York, 1958–71. Author of The History of Photography; Latent Image; and others.*

PHOTOGRAPHY (*in part*)

B.E.N. Brian E. Newton. *Professor of Linguistics, Simon Fraser University, Burnaby, British Columbia. Author of The Generative Interpretation of Dialect: A Study of Modern Greek Phonology.*

LANGUAGES OF THE WORLD (*in part*)

B.E.P. Bruce E. Poling. *Professor and Chairman, Department of Chemical Engineering, University of Toledo, Ohio. Coauthor of The Properties of Gases and Liquids.*

MATTER (*in part*)

B.F.S. Bradford Fuller Swan (d. 1976). *Theatre and Art Critic, The Providence Journal and Evening Bulletin, Rhode Island.*

UNITED STATES OF AMERICA (*in part*)

B.Fu. Bruce Furie, M.D. *Chief, Division of Hematology-Oncology, New England Medical Center; Professor of Medicine, Tufts University, Boston.*

BLOOD (*in part*)

B.F.W. Brian Frederick Windley. *Professor of Geology, University of*

Leicester, England. Author of The Evolving Continents.

EARTH SCIENCES, THE (*in part*)

EUROPE (*in part*)

GEOCHRONOLOGY (*in part*)

PRECAMBRIAN TIME (Micropædia)

URALIAN OROGENIC BELT (Micropædia)

B.G. Branko Grünbaum. *Professor of Mathematics, University of Washington, Seattle. Author of Convex Polytopes and others.*

COMBINATORICS AND COMBINATORIAL GEOMETRY (*in part*)

B.Ga. Balwant Gargi. *Playwright. Former Professor and Head, Department of Indian Theatre, Panjab University, Chandigarh, India. Author of Folk Theater of India and others.*

SOUTH ASIAN ARTS (*in part*)

B.Ge. Barbara Gelb. *Writer. Coauthor of O'Neill.*

O'NEILL, EUGENE (*in part*) (Micropædia)

B.G.M. Barbara G. Mertz. *Historian and writer. Author of Temples, Tombs and Hieroglyphs and others.*

MEMPHIS (EGYPT) (Micropædia)

B.G.S. Bernice Giduz Schubert. *Curator, Arnold Arboretum, Harvard University, 1969–84. Coauthor of The Begoniaceae of Colombia.*

ANGIOSPERMS (*in part*)

B.Gu. B. Gungaadash. *Senior Research Worker, Institute of Geography and Geocryology, Academy of Sciences, Ulaanbaatar, Mongolia.*

MONGOLIA (*in part*)

B.H.C. Ben H. Caudle. *B.J. Lancaster Professor of Petroleum Engineering, University of Texas at Austin. Author of Reservoir Engineering Fundamentals.*

INDUSTRIES, EXTRACTION AND PROCESSING (*in part*)

B.H.F. Brian Hinton Fletcher. *Bicentennial Professor of Australian History, University of Sydney. Author of Colonial Australia before 1850 and others.*

AUSTRALIA (*in part*)

B.-h.H. Bae-ho Hahn. *President, Sejong Institute, Seoul. Former Professor of Political Science, Korea University, Seoul. Author of Korean Political Change.*

KOREA (*in part*)

B.H.M. Brian H. Mason. *Emeritus Curator, Department of Mineral Sciences, Smithsonian Institution, Washington, D.C. An authority on the distribution of elements in the Earth's crust. Author of Principles of Geochemistry.*

CHEMICAL ELEMENTS (*in part*)

B.H.W. Brian H. Warmington. *Former Reader in Ancient History, University of Bristol, England. Author of The Roman North African Provinces and others.*

NORTH AFRICA (*in part*)

B.H.We. Byron H. Webb. *Consultant in dairy technology. Former Chief, Dairy Products Laboratory, Eastern Utilization Research and Development Division, Agricultural Research Service, U.S. Department of Agriculture, Washington,*

D.C. Coeditor of *Fundamentals of Dairy Chemistry*.

FARMING AND AGRICULTURAL TECHNOLOGY (in part)

B.I.B. Boris Ivan Balinsky. Emeritus Professor of Zoology, University of the Witwatersrand, Johannesburg, South Africa. Author of *An Introduction to Embryology*.

GROWTH AND DEVELOPMENT, BIOLOGICAL (in part)

Bi.C. Bin Cheng. Emeritus Professor of Air and Space Law, University of London. Author of *The Law of International Air Transport*.

TRANSPORTATION LAW (in part)

B.I.S. Bernard I. Spinrad. Emeritus Professor of Nuclear Engineering, Oregon State University, Corvallis, and Iowa State University, Ames. Coauthor and coeditor of *Nuclear Energy: A Sensible Alternative*.

ENERGY CONVERSION (in part)

B.Ja. Bernard Jacobson. Artistic Adviser, North Netherlands Orchestra. Author of *The Music of Johannes Brahms and others*

MUSICAL FORMS AND GENRES (in part)

B.J.C. Bryant J. Cratty. Emeritus Professor of Kinesiology, University of California, Los Angeles. Author of *Perceptual and Motor Development in Infants and Children and others*.

LEARNING AND COGNITION, HUMAN (in part)

B.J.Co. B. Jack Copeland. Professor of Philosophy, University of Canterbury, Christchurch, New Zealand. Author of *Artificial Intelligence: A Philosophical Introduction*.

ARTIFICIAL INTELLIGENCE

B.J.D.M. Bastiaan J.D. Meeuse. Emeritus Professor of Botany, University of Washington, Seattle. Author of *The Story of Pollination*; coauthor of *The Sex Life of Flowers*.

REPRODUCTION AND REPRODUCTIVE SYSTEMS (in part)

B.J.M. Sir Basil John Mason. President, University of Manchester Institute of Science and Technology, England. Director General, Meteorological Office, Bracknell, England, 1965–83. Author of *The Physics of Clouds*; *Clouds, Rain and Rainmaking*.

CLIMATE AND WEATHER (in part)

B.J.McG. Bernard J. McGinn. Professor of Historical Theology and the History of Christianity, University of Chicago. Author of *The Calabrian Abbot*.

CHRISTIANITY (in part)

B.Jo. Bernard Joy. Former football correspondent, Evening Standard, London. Author of *Soccer Tactics*.

SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

B.J.S. Brian J. Skinner. Professor of Geology and Geophysics, Yale University. Author of *Earth Resources*.

INDUSTRIES, EXTRACTION AND PROCESSING (in part)

B.J.T. Brian J. Thompson. Provost Emeritus, Distinguished University Professor, and Professor of Optics,

University of Rochester, New York. Author of *Physical Optics Notebook*.

OPTICS, PRINCIPLES OF (in part)

B.J.U. Benton J. Underwood (d. 1994). Stanley G. Harris Professor of Social Science, Northwestern University, Evanston, Illinois. Author of *Experimental Psychology*; coauthor of *Meaningfulness and Verbal Learning*.

MEMORY (in part)

B.K. Benjamin Keen. Emeritus Professor of History, Northern Illinois University, De Kalb. Editor of *Readings in Latin American Civilization, 1492 to the Present and others*.

BALBOA, VASCO NÚÑEZ DE (Micropædia)

B.K.M. Barrie K. Macdonald. Professor of History, Massey University, Palmerston North, New Zealand. Author of *Cinderellas of the Empires: Towards a History of Kiribati and Tuvalu and others*.

PACIFIC ISLANDS (in part)

B.K.N. Basheer K. Nijim (d. 1991). Professor of Geography, University of Northern Iowa, Cedar Falls, 1972–91. Coeditor of *The Arab World: A Handbook*.

ARABIA (in part)

B.K.S. Brian K. Smith. Assistant Professor of Religion, Barnard College, Columbia University. Author of *Reflections on Resemblance, Ritual and Religion*.

HINDUISM (in part)

B.L. Barnabas Lindars (d. 1991). Rylands Professor of Biblical Criticism and Exegesis, Victoria University of Manchester, England, 1978–90. Author of *Jesus Son of Man*.

PAUL, THE APOSTLE

B.L.C. Barbara Lovett Cline. Biology teacher. Author of *The Questioners: Physicists and the Quantum Theory*.

BROGLIE, LOUIS-VICTOR, 7^e DUC DE (Micropædia)

DIRAC, P.A.M. (Micropædia)

B.L.G. Burton L. Gordon. Emeritus Professor of Geography, San Francisco State University. Author of *A Panama Forest and Shore and others*.

CENTRAL AMERICA (in part)

NORTH AMERICA (in part)

B.L.K. Barry L. Karger. James L. Waters Professor of Analytical Chemistry; Director, Barnett Institute, Northeastern University, Boston. Coauthor of *Introduction to Separation Science*.

ANALYSIS AND MEASUREMENT, PHYSICAL AND CHEMICAL (in part)

B.L.Kl. B.L. Klock. Physical Scientist, Research and Engineering Directorate, Advanced Weapons Systems Division, Defense Mapping Agency, U.S. Department of Defense, Washington, D.C. Editor of *Fundamental Star Catalogs*.

TELESCOPES (in part)

B.L.S. Bruce Lannes Smith. Emeritus Professor of Political Science, Michigan State University, East Lansing. Coauthor of *Propaganda, Communication and Public Opinion*.

PROPAGANDA

B.L.T. B.L. Turner. Professor of Botany; Director, Plant Resources Center, University of Texas at Austin. Author of *Legumes of Texas*.

ANGIOSPERMS (in part)

B.L.v.d.W. Bartel Leendert van der Waerden. Emeritus Professor of Mathematics, University of Zürich. Author of *Science Awakening and others*.

EUCLID (Micropædia)

B.M. Björn Matthiasson. Economist, Ministry of Finance, Reykjavik, Iceland.

ICELAND (in part)

B.Ma. Benjamin March (d. 1940). Curator of Asiatic Art, Detroit Institute of Arts. Author of *The History of Chinese Painting in Outline*.

DECORATIVE ARTS AND FURNISHINGS (in part)

B.M.A. Bruce M. Alberts. President, National Academy of Sciences, Washington, D.C. Professor of Biochemistry and Biophysics, University of California, San Francisco. Coauthor of *The Molecular Biology of the Cell*.

CELLS (in part)

B.M.B. Bridget M. Brereton. Reader in History, University of the West Indies, St. Augustine, Trinidad. Author of *A History of Modern Trinidad and others*.

WEST INDIES, THE (in part)

B.M.Bo. Brian M. Boom. Vice President for Botanical Science, New York Botanical Garden, Bronx. Author of *"Ethnobotany of the Chacobo Indians, Beni Bolivia"* in *Advances in Economic Botany* (vol. 4).

ANGIOSPERMS (in part)

B.M.H. Bernice Margaret Hamilton. Life member, Clare Hall, University of Cambridge. Former Senior Lecturer in Politics, University of York, Heslington, England. Author of *Political Thought in 16th-Century Spain*.

VITORIA, FRANCISCO DE (Micropædia)

B.Mo. Brita Maud Ellen Mortensen (d. 1958). Lecturer in Swedish, University of Cambridge, 1950–58. Coauthor of *An Introduction to Scandinavian Literature*.

SCANDINAVIAN LITERATURE (in part)

STRINDBERG, AUGUST (Micropædia)

B.M.W. Bernd Michael Wiese. Lecturer in Geography, University of Cologne. Author of *Zaire and others*.

CENTRAL AFRICA (in part)

B.N. Bruno Nettl. Professor of Music and of Anthropology, University of Illinois at Urbana-Champaign. Author of *The Study of Ethnomusicology*; *Folk and Traditional Music of the Western Continents*.

FOLK ARTS (in part)

B.Ne. Bert Nelson (d. 1994). Cofounder and Editor, Track & Field News. Editor of *Little Gold Book*; *Olympic Track & Field*.

SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

B.Ni. Bernard Nietschmann. Professor of Geography, University of California, Berkeley. Author of *Between Land and Water: The Subsistence Ecology of the Miskito Indians, Eastern Nicaragua*.

CENTRAL AMERICA (in part)

B.N.P. Baij Nath Puri. *Emeritus Professor of Ancient Indian History and Archaeology, University of Lucknow, India. Author of Cities of Ancient India and others.*

TAXILA (in part) (Micropædia)

B.O'G. Brendan Anthony O'Grady. *Professor of English, University of Prince Edward Island, Charlottetown.*

CANADA (in part)

B.O'K. Bernard O'Kelly. *Dean, College of Arts and Sciences; Professor of English, University of North Dakota, Grand Forks.*

UNITED STATES OF AMERICA (in part)

B.P.B. B. Philip Bigler. *Historian and humanities teacher. Author of Washington in Focus; In Honored Glory; Hostile Fire; and others.*

WHITE HOUSE (Micropædia)

B.P.L. Bruce Peter Luyendyk. *Professor of Marine Geophysics; Director, Institute for Crustal Studies, University of California, Santa Barbara. Coeditor of Initial Reports of the Deep Sea Drilling Project (vol. 26 and 49).*

OCEANS (in part)

B.P.S. Brian P. Smentkowski. *Associate Dean, College of Liberal Arts, and Professor of Political Science, Southeast Missouri State University, Cape Girardeau.*

THOMAS, CLARENCE (Micropædia)

B.R. Bayard Rankin. *Associate Editor, Mathematics, Encyclopædia Britannica, Chicago, 1971–73. Associate Professor of Mathematics, Case Western Reserve University, Cleveland, Ohio, 1960–71. Coauthor and editor of Differential Space, Quantum Systems, and Prediction.*

AUTOMATA THEORY (in part)

B.Ra. Benjamin Rader. *Professor of History, University of Nebraska at Lincoln. Author of Baseball: A History of America's Game.*

BASEBALL (in part)

Br.M. Brian Morton. *Professor of Ecology and Biodiversity; Director, Swire Institute of Marine Science, University of Hong Kong. Author of Partnerships in the Sea.*

MOLLUSKS (in part)

B.R.N. B.R. Nanda. *Former Director, Nehru Memorial Museum and Library, New Delhi. Author of Mahatma Gandhi: A Biography and others.*

GANDHI

B.R.W. Bryan R. Wilson. *Emeritus Reader in Sociology, University of Oxford. Author of Religion in Sociological Perspective and others.*

MORMON (in part) (Micropædia)

B.S. Brooke Schumm, Jr. *President, Eagle-Cliffs, Inc. (consultants), Bay Village, Ohio. Senior Technology Associate, Eveready Battery Company, Westlake, Ohio, 1962–89. Editor of Handbook of Manganese Dioxides.*

ENERGY CONVERSION (in part)

B.S.B. Benedikt Sigurdur Benedikz. *Former Head of Special Collections, Library, University of Birmingham,*

England. Author of The Varangians of Byzantium.

SCANDINAVIAN LITERATURE (in part)

B.S.Ba. Bernard S. Bachrach. *Professor of History, University of Minnesota, Minneapolis. Author of Merovingian Military Organization and others.*

FRANCE (in part)

B.Sc. Bobb Schaeffer. *Emeritus Curator of Vertebrate Paleontology, American Museum of Natural History, New York City.*

FISHES (in part)

B.S.L. Bruce Sween Liley. *Professor of Physics, University of Waikato, Hamilton, New Zealand.*

MATTER (in part)

B.S.Lo. Barry Steven Lorge. *Consultant. Former Sports Editor, The San Diego Union, California. Contributor to Tennis Magazine.*

SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

B.S.M. Basil S. Markesinis. *Professor of European Private Law, University College, University of London. Professor of Anglo-American Law, State University of Leiden, The Netherlands. Author of The German Law of Torts: A Comparative Introduction.*

TORTS

B.Sv. B. Shirendev. *Historian. Former President, Academy of Sciences, Ulaanbaatar, Mongolia.*

MONGOLIA (in part)

B.T.D. Bernard Thomas Donovan. *Emeritus Professor of Neuroendocrinology, Institute of Psychiatry, University of London.*

REPRODUCTION AND REPRODUCTIVE SYSTEMS (in part)

B.T.K.B. B.T.K. Barry. *Director, International Tin Research Institute, Uxbridge, England. Coauthor of Tin and Its Alloys and Compounds; Technology of Tinplate.*

INDUSTRIES, EXTRACTION AND PROCESSING (in part)

B.T.S. Bradley Titus Scheer. *Emeritus Professor of Biology, University of Oregon, Eugene. Author of Animal Physiology.*

BIOLOGICAL SCIENCES, THE (in part)

B.T.Sh. Byron Thomas Shaw. *Assistant to Administrator, Agricultural Research Service, U.S. Department of Agriculture, Washington, D.C., 1965–68.*

AGRICULTURAL SCIENCES (in part)

Bu.H.W. Burns H. Weston. *Bessie Dutton Murray Distinguished Professor of Law; Associate Dean for International and Comparative Legal Studies, University of Iowa, Iowa City. Coauthor of Human Rights in the World Community and others.*

HUMAN RIGHTS

B.V. Birgit Vennesland. *Head, Vennesland Research Laboratory, Max Planck Society, 1970–81; Director, Max Planck Institute for Cell Physiology, Berlin, 1968–70.*

BIOLOGICAL SCIENCES, THE (in part)

B.V.Gy. Bo Vilhelm Gyllensvärd. *Former Director, Museum of Far Eastern Antiquities, Stockholm. Assistant Professor, Far Eastern Section, Institute of History of Art, University of Stockholm. Author of T'ang Gold and Silver and others.*

DECORATIVE ARTS AND FURNISHINGS (in part)

B.Vi. Brent Vine. *Associate Professor of Classics, University of California, Los Angeles. Author of Studies in Archaic Latin Inscriptions.*

LANGUAGES OF THE WORLD (in part)

B.V.S. Brian Vincent Street. *Senior Lecturer in Social Anthropology, University of Sussex, Brighton, England. Author of The Savage in Literature and others.*

TYLOR, SIR EDWARD BURNETT (Micropædia)

B.W. Basil Willey (d. 1978). *King Edward VII Professor of English Literature, University of Cambridge, 1946–64. Author of Darwin and Butler: Two Versions of Evolution and others.*

ARNOLD, MATTHEW (in part) (Micropædia)

B.W.B. Bernard Winslow Beckingsale. *Former Senior Lecturer in Modern History, University of Newcastle upon Tyne, England. Author of Burghley: Tudor Statesman and others.*

CECIL, WILLIAM, 1ST BARON BURGHLEY (in part) (Micropædia)

B.-W.C. Byong-Wuk Chong. *Former Professor of Korean Literature, Seoul National University. Author of Essays on Korean Literature; Complete Anthology of Sijo.*

KOREAN LITERATURE (in part)

B.We. Bruce Webster. *Former Senior Lecturer in History, University of Kent at Canterbury, England.*

ROBERT I (SCOTLAND) (Micropædia)

B.W.H. Bruce W. Halstead, M.D. *Director, World Life Research Institute, Colton, California. Author of Poisonous and Venomous Marine Animals of the World.*

POISONS AND POISONING (in part)

B.W.M. Bernard W. Minifie. *Consultant, Richardson Researches Inc. (consultants to the candy industry), Hayward, California. Author of Chocolate, Cocoa and Confectionery: Science and Technology.*

FOOD PROCESSING (in part)

B.W.Ma. B.W. Mazur. *Lecturer in Polish Language and Literature, School of Slavonic and East European Studies, University of London. Author of Colloquial Polish.*

POLISH LITERATURE (in part)

B.Wn. Brian Weinstein. *Professor of Political Science, Howard University, Washington, D.C. Author of Eboué; coauthor of Introduction to African Politics.*

CENTRAL AFRICA (in part)

B.Wo. Bernard Wood. *Derby Professor of Anatomy, University of Liverpool, England. Author of Human Evolution; Evolution of Early Man.*

EVOLUTION, HUMAN (in part)

MUSCLES AND MUSCLE SYSTEMS (in part)

B.W.W. Bruce Withington Wilshire. *Professor of Philosophy, Rutgers University, New Brunswick, New Jersey. Author of Metaphysics and others.*
METAPHYSICS (in part)

B.W.Wa. Bruce W. Watson. *Commander, U.S. Navy (retired). Adjunct Professor of Soviet Studies, Defense Intelligence College, Washington, D.C., and Montgomery College, Rockville, Maryland. Author of Committed to Excellence: Systemic Problems in the U.S. Intelligence Community.*
WAR, THE THEORY AND CONDUCT OF (in part)

B.Z.B. Rabbi Ben Zion Bokser (d. 1984). *Rabbi, Forest Hills Jewish Center, Forest Hills, New York. Adjunct Professor of Political Science, Queens College, City University of New York. Author of The Legacy of Maimonides.*
MAIMONIDES, MOSES (Micropædia)

C.A.B. Clifford A. Barnes. *Emeritus Professor of Oceanography, University of Washington, Seattle. Author of numerous articles on oceanography.*
ATLANTIC OCEAN, THE (in part)

C.A.Bl. Conrad Alexander Blyth. *Professor of Economics, University of Auckland, New Zealand. Author of Inflation in New Zealand and others.*
NEW ZEALAND (in part)

Ca.C. Camille Camara. *Former Educational Adviser, Ministry of Agriculture, Abidjan, Ivory Coast. Author of Saint-Louis du Sénégal; Le Nigeria.*
AFRICA (in part)
WESTERN AFRICA (in part)

Ca.G. Carlton Gamer. *Composer. Emeritus Professor of Music, Colorado College, Colorado Springs.*
MUSICAL INSTRUMENTS (in part)

C.A.G. Christian Antoine Girault. *Director of Research, National Centre for Scientific Research, Paris. Author of Le Commerce du café en Haiti.*
WEST INDIES, THE (in part)

C.A.G.W. C.A.G. Wiersma (d. 1979). *Professor of Biology, California Institute of Technology, Pasadena, 1947–76. Editor of Invertebrate Nervous Systems.*
SENSORY RECEPTION (in part)

C.-A.La. Charles-André Laffargue. *General, French Army (retired). Author of Foch et la Bataille de 1918 and others.*
FOCH, FERDINAND (Micropædia)

C.A.Lo. Craig A. Lockard. *Professor of History, Social Change and Development, University of Wisconsin, Green Bay. Author of From Kampung to City: A Social History of Kuching, Malaysia, 1820–1970.*
SOUTHEAST ASIA (in part)

C.A.M. Carlile Aylmer Macartney (d. 1978). *Research Fellow, All Souls College, University of Oxford, 1936–65. Montagu Burton Professor of International Relations, University of Edinburgh, 1951–57. Author of Hungary: A Short History and others.*
DEÁK, FERENC (in part) (Micropædia)
HUNGARY (in part)
KOSSUTH, LAJOS (Micropædia)

C.A.McC. Charles A. McClelland. *Emeritus Professor of International Relations, University of Southern California, Los Angeles. Author of Theory and the International System.*
SOCIAL SCIENCES, THE (in part)

C.A.McI. Christopher Angus McIntosh. *Editor and writer, Mitchell Beazley (publisher), London. Author of The Swan King: Ludwig II of Bavaria.*
COLOGNE (in part)
HAMBURG (in part)

C.A.M.K. Cuchlaine Audrey Muriel King. *Emeritus Professor of Physical Geography, University of Nottingham, England. An authority on coastal geomorphology. Author of Beaches and Coasts; An Introduction to Oceanography.*
OCEANS (in part)

C.A.P. Christopher A. Pallis. *Emeritus Reader in Neurology, Royal Postgraduate Medical School, University of London. Author of The ABC of Brain Stem Death.*
DEATH

C.A.R. Colin Alistair Ronan (d. 1995). *Science writer and lecturer. Author of The Cambridge Illustrated History of the World's Science and many others.*
CALENDAR (in part)
HIPPARCHUS (in part) (Micropædia)
RUSSELL, HENRY NORRIS (Micropædia)

C.A.T. Cornelius A. Tobias. *Professor of Biophysics and Medical Physics, University of California, Berkeley. Author of papers on radiation biophysics and cancer research.*
RADIATION (in part)

C.A.V. Claude A. Villee. *Andelot Professor of Biological Chemistry, Medical School, Harvard University. Author of Biological Principles and Processes.*
BIOLOGICAL SCIENCES, THE (in part)

C.A.Wi. Carol Ann Winker. *Reporter. Cayman Free Press Ltd., George Town.*
WEST INDIES, THE (in part)

C.B. Cindy Brick. *Quilt appraiser and quilting teacher. Managing Editor, Crazy Quilt Society Newsletter.*
APPLIQUÉ (Micropædia)
PATCHWORK (Micropædia)
QUILTING (Micropædia)

C.Ba. Clive Barker. *Senior Lecturer in Theatre Studies, University of Warwick, England. Coeditor, New Theatre Quarterly. Author of Theatre Games.*
THEATRICAL PRODUCTION (in part)

C.B.B. Carl B. Boyer (d. 1976). *Professor of Mathematics, Brooklyn College, City University of New York, 1952–76. Author of History of Analytic Geometry and others.*
EULER, LEONHARD (Micropædia)
FERMAT, PIERRE DE (Micropædia)

C.B.G. Charles Burroughs Gill. *Emeritus Professor of Metallurgical Engineering, Lafayette College, Easton, Pennsylvania. Author of Materials Beneficiation and others.*
INDUSTRIES, EXTRACTION AND PROCESSING (in part)

C.Bi. Cyril Bibby (d. 1987). *Principal, Kingston upon Hull College of Education, University of Hull Institute of Education,*

England, 1959–76. Author of T.H. Huxley: Scientist, Humanist, and Educator and others.

HUXLEY, SIR ANDREW FIELDING (Micropædia)

HUXLEY, SIR JULIAN (Micropædia)

HUXLEY, T.H. (Micropædia)

C.Bl. Claude Blair. *Keeper of Metalwork, Victoria and Albert Museum, London, 1972–82. Author of European Armour and others.*

DECORATIVE ARTS AND FURNISHINGS (in part)

C.B.MacD. Charles B. MacDonald (d. 1990). *Deputy Chief Historian, U.S. Army Center of Military History, Washington, D.C., 1967–80. Author of A Time for Trumpets: The Untold Story of the Battle of the Bulge and others.*

WAR, THE TECHNOLOGY OF (in part)

C.B.My. Charles B. Morrey, Jr. (d. 1984). *Professor of Mathematics, University of California, Berkeley, 1945–73. Author of Multiple Integrals in the Calculus of Variations.*
ANALYSIS (IN MATHEMATICS) (in part)

C.B.V. Constance B. Vanacore. *Freelance writer. Features Editor, Pure-Bred Dogs, American Kennel Gazette, 1974–81. Author of Dog Showing: An Owner's Guide and others.*

DOGS

C.C. Claude Cahen (d. 1991). *Professor of Islāmic History, University of Paris I, 1959–79. Author of La Syrie du nord à l'époque des croisades and others.*

ALP-ARSLAN (Micropædia)

C.C.A. Claude C. Albritton (d. 1988). *Hamilton Professor of Geology, Southern Methodist University, Dallas, Texas, 1955–78. Coauthor and editor of The Fabric of Geology; Uniformity and Simplicity.*

EARTH SCIENCES, THE (in part)

C.C.B. Charles Calvert Bayley. *Emeritus Professor of History, McGill University, Montreal. Author of The Formation of the German College of Electors in the Mid-Thirteenth Century and others.*

GERMANY (in part)

C.C.C. Catherine C. Cutbill. *Graduate student in anthropology, University of Virginia, Charlottesville. Field researcher in Djibouti, 1984 and 1987–88.*

EASTERN AFRICA (in part)

C.Ce. Charles Cestre (d. 1959). *Professor of American Literature and Civilization, University of Paris, 1917–42. Author of Histoire de la littérature américaine and others.*

POE, EDGAR ALLAN (in part) (Micropædia)

C.Ch. Charles Chadwick. *Emeritus Professor of French, University of Aberdeen, Scotland. Author of Mallarmé, sa pensée dans sa poésie and others.*
MALLARMÉ, STÉPHANE (Micropædia)

C.Cl. Cecil Clutton (d. 1991). *Secretary, Organs Advisory Committee, Council for the Care of Churches, London. Fellow,*

Society of Antiquaries, London. Author of The British Organ and others.

MUSICAL INSTRUMENTS (in part)

C.C.M. Claudius Cornelius Müller. *Head, East Asian Department, Museum of Ethnology, Berlin. Author of Untersuchungen zum Erdalter she im China der Chou- und Han-Zeit.*

SHIH HUANG-TI (in part) (Micropædia)

C.C.MacD. C.C. MacDuffee (d. 1961). *Professor of Mathematics, University of Wisconsin, Madison, 1943–61. President, Mathematical Association of America, 1945–46. Author of The Theory of Matrices and others.*

ARITHMETIC (in part)

C.Co. Colin Coulter. *Lecturer in Sociology, National University of Ireland, Maynooth. Author of Contemporary Northern Irish Society: An Introduction.*

UNITED KINGDOM (in part)

C.C.O'B. Conor Cruise O'Brien. *Pro-Chancellor, University of Dublin. Editor in Chief, The Observer, London, 1978–81. Member, Seanad Eireann, Dublin, 1977–79; Dáil Eireann, 1969–77. Author of Parnell and His Party.*

PARNELL, CHARLES

STEWART (Micropædia)

C.C.P. Cuthbert Coulson Pounder. *Marine engineering consultant. Director and Chief Technical Engineer, Harland and Wolff Ltd., Belfast, Northern Ireland, 1930–65. Coauthor of Marine Diesel Engines.*

INDUSTRIES, MANUFACTURING (in part)

C.Cu. Charles Cudworth (d. 1977). *Curator, Pendlebury Library of Music, University of Cambridge, 1957–73.*

HANDEL, GEORGE FRIDERIC (in part)

(Micropædia)

C.D. Carlo Diano (d. 1974). *Professor of Greek Literature, University of Padua, Italy. Author of Lettre di Epicuro e dei suoi; editor of Epicuri Ethica.*

EPICURUS (Micropædia)

PHILOSOPHICAL SCHOOLS AND DOCTRINES,

WESTERN (in part)

C.D.Cu. Charles D. Cuttler. *Emeritus Professor of Art History, University of Iowa, Iowa City. Author of Northern Painting from Pucelle to Bruegel.*

SLUTER, CLAUS (in part) (Micropædia)

C.D.H. Chauncy D. Harris. *Samuel N. Harper Distinguished Service Professor Emeritus of Geography, University of Chicago. Author of Cities of the Soviet Union: Studies in Their Functions, Size, Density, and Growth.*

GEOGRAPHY

MONGOLIA (in part)

C.D.K. Carol D. Kiesinger. *Arts consultant. Hiker and mountain climber. Coeditor of The Armchair Mountaineer.*

MOUNTAINEERING (in part) (Micropædia)

C.D.Kl. Curtis D. Klaassen. *Professor of Pharmacology and Toxicology, University of Kansas Medical Center, Kansas City.*

POISONS AND POISONING (in part)

C.D.McG. Clare D. McGillem. *Emeritus Professor of Electrical Engineering, Purdue University, West Lafayette, Indiana.*

Coauthor of Modern Communications and Spread Spectrum.

TELECOMMUNICATIONS SYSTEMS (in part)

C.Do. Clifford Dowdey (d. 1979). *Lecturer in Creative Writing, University of Richmond, Virginia, 1958–69. Author of Lee and others; editor of The Wartime Papers of Robert E. Lee.*

LEE, ROBERT E. (Micropædia)

C.D.R. C.D. Ross (d. 1986). *Professor of Medieval History, University of Bristol, England. Author of The Wars of the Roses and others.*

HENRY V (ENGLAND) (Micropædia)

C.D.S. Catherine Delano Smith. *Research Fellow, Institute of Historical Research, University of London. Author of Western Mediterranean Europe: A Historical Geography of Italy, Spain and Southern France Since the Neolithic and others.*

GREECE (in part)

PORTUGAL (in part)

SPAIN (in part)

C.D.T. Conrad D. Totman. *Professor of History, Yale University. Author of Ieyasu: Shogun and others.*

TOKUGAWA IEYASU (Micropædia)

C.E.C. Charles Edward Casolani. *Lieutenant Colonel, British Army (retired). Amateur rider, show jumper, and trainer, 1919–56.*

HORSES AND HORSEMANSHIP (in part)

C.E.Ca. Concepción E. Castañeda. *Former Associate Professor of Spanish, Millikin University, Decatur, Illinois. Professor of Geography, University of Havana, 1960–62.*

SOUTH AMERICA (in part)

C.E.Co. Charles E. Cornelius, D.V.M. *Emeritus Professor of Molecular Biosciences, School of Veterinary Medicine, University of California, Davis. Director, California Primate Research Center, 1981–87. Editor of Advances in Veterinary Science and Comparative Medicine.*

DISEASE (in part)

C.E.E. Cyril Ernest Everard. *Former Senior Lecturer in Geography, Queen Mary College, University of London.*

ATLANTIC OCEAN, THE (in part)

C.E.F. C.E. Ferreira. *Lecturer in Geography, University of Pretoria, South Africa.*

AFRICA (in part)

C.E.G. Creighton E. Gilbert. *Professor of History of Art, Yale University. Author of Michelangelo on and off the Sistine Ceiling; editor and translator of Complete Poems and Selected Letters of Michelangelo.*

MICHELANGELO

C.E.Gr. Charles E. Greer. *Professor of Geography and of East Asian Languages and Cultures, Indiana University, Bloomington. Author of Water Management in the Yellow River Basin of China.*

ASIA (in part)

C.E.I. Carroll E. Izard. *Unidel Professor of Psychology, University of Delaware, Newark. Author of Human Emotions.*

EMOTION, HUMAN

C.E.McL. Charles E. McLure, Jr. *Senior Fellow, Hoover Institution on War, Revolution and Peace, Stanford University, California. Author of The Value Added Tax: Key to Deficit Reduction and others.*

TAXATION (in part)

C.E.N. Clyde Everett Noble. *Former Professor of Experimental Psychology, University of Georgia, Athens. Author of Outline of Psychological Measurement; Human Variation; and others.*

LEARNING AND COGNITION, HUMAN (in part)

C.E.No. Charles E. Nowell (deceased). *Professor of History, University of Illinois at Urbana-Champaign. Author of The Great Discoveries and the First Colonial Empires and others.*

EUROPEAN OVERSEAS EXPLORATION AND

EMPIRES, THE HISTORY OF (in part)

HENRY THE NAVIGATOR (Micropædia)

C.E.T. Cecil Edgar Tilley (d. 1973). *Professor of Mineralogy and Petrology, University of Cambridge, 1931–61. World authority on igneous petrology.*

BOWEN, NORMAN L. (in part) (Micropædia)

MINERALS AND ROCKS (in part)

C.Fa. Clifton Fadiman (d. 1999). *Writer and editor. Member, Board of Editors, Encyclopædia Britannica, 1959–98. Chief Editorial Adviser, Book-of-the-Month Club, 1944–93. Advisory Editor, Cricket: The Children's Magazine. Author of The Lifetime Reading Plan and many others.*

LITERATURE, THE ART OF (in part)

C.F.A.S. Claude Frédéric Armand Schaeffer (d. 1982). *Professor of the Archaeology of Western Asia, College of France, Paris, 1954–69. Director of the French Archaeological Expeditions to Ras Shamra-Ugarit, Syria, and Enkomi-Alasia, Cyprus. Editor of Ugaritica I to VII.*

UGARIT (Micropædia)

C.Fe. Cyrille Felteau. *Journalist and historian. Former Editorial and News Writer, La Presse, Montreal.*

MONTREAL (in part)

C.F.E.R. Clyde F.E. Roper. *Curator of Mollusca, Department of Invertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington, D.C. Coauthor of Cephalopods of the World.*

MOLLUSKS (in part)

C.F.F. Charles F. Fuechsel (d. 1977). *Atlantic Region Engineer, Topographic Division, Geological Survey, U.S. Department of the Interior, Washington, D.C., 1959–65. Author of numerous articles on mapping and surveys.*

MAPPING AND SURVEYING (in part)

C.F.K. Carl Fred Koch. *Professor of Geological Sciences, Old Dominion University, Norfolk, Virginia.*

GEOCHRONOLOGY (in part)

C.F.Ke. Charles F. Keyes. *Professor of Anthropology and International Studies; Director, Northwest Consortium for*

Southeast Asian Studies, University of Washington, Seattle. Author of Thailand: Buddhist Kingdom as Modern Nation State.

SOUTHEAST ASIA (in part)

C.F.M. Clovis F. Maksoud. *Permanent Observer of the League of Arab States to the United Nations. Author of The Crisis of the Arab Left and others.*

LEBANON (in part)

C.F.O. Christian F. Otto. *Professor of the History of Architecture, Cornell University, Ithaca, New York.*

BORROMINI, FRANCESCO (Micropædia)

C.F.Q. Calvin F. Quate. *Professor of Applied Physics and Electrical Engineering, Stanford University, California.*

MICROSCOPES (in part)

C.F.S. Carl Fredrik Sandelin. *Novelist. Former General Manager and Editor in Chief, Finnish News Agency, Helsinki.*

FINLAND (in part)

C.F.V. Charles F. Voegelin (d. 1986). *Distinguished Professor of Anthropology and of Linguistics, Indiana University, Bloomington, 1967–76. Editor, International Journal of American Linguistics. Coauthor of Classification and Index of the World's Languages.*

LANGUAGES OF THE WORLD (in part)

C.F.W. Christopher Frederick Wooldridge. *University Lecturer in Maritime Geography, University of Wales College of Cardiff. Author of Tidal Flow Atlas of the Port of Dover.*

ATLANTIC OCEAN, THE (in part)

C.Fy. Christopher Fyfe. *Former Reader in African History, University of Edinburgh. Author of A History of Sierra Leone.*

WESTERN AFRICA (in part)

C.G. Christiaan Glasz. *Former Professor of Public Finance, State University of Leiden, The Netherlands. Royal Commissioner, De Nederlandsche Bank.*

MARKETS (in part)

C.Ga. Clemente Garavito. *President, Colombian Geographical Society, Bogotá. Author of numerous articles on geography.*

COLOMBIA (in part)

C.G.C. Colin Graham Clarke. *Lecturer in Geography, University of Oxford; Official Fellow of Jesus College, Oxford. Author of Kingston, Jamaica: Urban Development and Social Change, 1692–1962 and others.*

WEST INDIES, THE (in part)

C.G.F. Craig G. Fraser. *Associate Professor, Institute for the History and Philosophy of Science and Technology, University of Toronto.*

MATHEMATICS, THE HISTORY OF (in part)

C.G.G. Charles Goode Gomillion (d. 1995). *Professor of Sociology, Tuskegee Institute, Alabama, 1959–71.*

UNITED STATES OF AMERICA (in part)

C.G.H. Carl G. Hempel. *Stuart Professor Emeritus of Philosophy, Princeton University. University Professor of Philosophy, University of Pittsburgh,*

Pennsylvania. Author of Philosophy of Natural Science.

CARNAP, RUDOLF (Micropædia)

C.G.P. Charles G. Pearson. *Emeritus Professor of Journalism, Wichita State University, Kansas.*

UNITED STATES OF AMERICA (in part)

C.G.S. Charles Gordon Smith. *Emeritus Fellow of Keble College, Oxford; former Lecturer in Geography, University of Oxford. Editor of Oxford Regional Economic Atlas: The Middle East and North Africa.*

AFRICA (in part)

ARABIA (in part)

EGYPT (in part)

SYRIA (in part)

C.G.St. Chester G. Starr. *Bentley Professor Emeritus of Ancient History, University of Michigan, Ann Arbor. Author of Rise and Fall of the Ancient World and others.*

PEISISTRATUS (Micropædia)

C.G.T. Constantine Gennadiyevich Tikhotskiy. *Former Professor, Moscow M.V. Lomonosov State University. Author of numerous articles on hydrology.*

ASIA (in part)

C.H. Claude Harmel. *Editor, Les Études Sociales et Syndicales, Paris. Former Secretary, Institute for Social History, Paris. Author of Lettre à Léon Blum sur le socialisme et la paix and others.*

JAURÈS, JEAN (Micropædia)

C.Ha. Carl Hanson (d. 1985). *Pro-Vice-Chancellor, Professor of Chemical Engineering, University of Bradford, England. Editor of Recent Advances in Liquid-Liquid Extraction.*

ENGINEERING (in part)

C.H.A. Clyde H. Amundson. *Director, Aquaculture Research Center; Professor and Chairman, Department of Food Science; Professor of Oceanography and Limnology, University of Wisconsin, Madison.*

FISHING, COMMERCIAL (in part)

Ch.A.R. Charles A. Ross. *Senior Biostratigrapher, Chevron U.S.A., Inc., Houston, Texas. Editor of Timing and Depositional History of Eustatic Sequences.*

GEOCHRONOLOGY (in part)

Ch.C. Christopher Chow. *Writer on biology.*

CELLS (in part)

C.H.C. Charles Henry Cotter (deceased). *Senior Lecturer in Maritime Studies, University of Wales Institute of Science and Technology, Cardiff. Author of The Physical Geography of the Oceans.*

PACIFIC OCEAN, THE (in part)

Ch.D. Charles Donahue, Jr. *Professor of Law, Harvard University. Coauthor of Property: An Introduction to the Concept and the Institution.*

PROPERTY LAW

C.H.D. Calaway H. Dodson. *Senior Curator, Missouri Botanical Garden, St. Louis. Coauthor of Orchid Flowers: Their*

Pollination and Evolution; The Biology of the Orchids.

ANGIOSPERMS (in part)

C.H.F. Clarence Henry Faust (d. 1975). *President, Fund for the Advancement of Education, 1951–57; Vice President, The Ford Foundation, New York City, 1957–75.*

DEWEY, JOHN (in part) (Micropædia)

C.H.G. Cyrus H. Gordon. *Emeritus Professor of Hebraic and Near East Studies; Director, Center for Ebla Research, New York University, New York City. Emeritus Professor of Mediterranean Studies, Brandeis University, Waltham, Massachusetts. Author of The Ancient Near East and others.*

MIDDLE EASTERN RELIGIONS, ANCIENT (in part)

SOLOMON (in part) (Micropædia)

C.H.G.-S. Charles Harvard Gibbs-Smith (d. 1981). *Research Fellow, Science Museum, London, 1976–81. Keeper, Public Relations and Education Department, Victoria and Albert Museum, London, 1947–71. Author of The Wright Brothers and others.*

WRIGHT, ORVILLE AND WILBUR (Micropædia)

C.H.H. Charles Harold Hayward. *Freelance writer and artist. Editor, Woodworker, 1939–65. Author of English Period Furniture and others.*

INDUSTRIES, MANUFACTURING (in part)

Ch.Ha. Charles Hauss. *Professor of Political Science, George Mason University, Fairfax, Virginia; Director of Policy and Research, Search for Common Ground–USA. Author of Comparative Politics: Domestic Responses to Global Challenges and others.*

POLITICAL SYSTEMS (in part)

C.H.Ha. Cadet H. Hand, Jr. *Emeritus Professor of Zoology, University of California, Berkeley; Emeritus Director, Bodega Marine Laboratory, Bodega Bay, California.*

CNIDARIANS (in part)

C.H.Ho. Cyrus Henry Hoy. *John B. Trevor Professor Emeritus of English, University of Rochester, New York. Author of The Hyacinth Room: An Investigation into the Nature of Comedy, Tragedy, and Tragicomedy.*

LITERATURE, THE ART OF (in part)

C.Hi. Christopher Hibbert. *Historian and biographer. Author of Benito Mussolini; The Rise and Fall of Il Duce.*

MUSSOLINI, BENITO (in part) (Micropædia)

Ch.L. Chao Lin. *Former Visiting Associate Professor of History, National Chung-hsing University, Tai-chung, Taiwan. Author of Marriage, Inheritance and Lineage Organization in Shang-Chou China.*

CALENDAR (in part)

C.H.L. Clarence H. Lorig (d. 1975). *Assistant Director, Battelle Memorial Institute, Columbus, Ohio, 1947–65. Author of Copper as an Alloying Element in Steel and Cast Iron.*

INDUSTRIES, EXTRACTION AND PROCESSING (in part)

C.H.Li. Carter H. Lindberg. *Professor of Church History, Boston University. Author of The Third Reformation?*

CHRISTIANITY (in part)

C.H.Lo. Charles H. Long. *Professor of Religious Studies; Director, Center for Black Studies, University of California, Santa Barbara. Author of Alpha: Myths of Creation and others.*

DOCTRINES AND DOGMAS, RELIGIOUS (in part)

C.H.P. Clifford Hillhouse Pope (d. 1974). *Science writer. Curator, Division of Reptiles and Amphibians, Field Museum of Natural History, Chicago, 1941–53. Author of The Reptile World; Turtles of the United States and Canada.*

REPTILES (in part)

Ch.R. Chaim Rabin. *Former Professor of Hebrew Language, Hebrew University of Jerusalem. Author of Qumran Studies and others.*

HEBREW LITERATURE (in part)

Ch.S. Charles Süsskind. *Emeritus Professor of Engineering Science, University of California, Berkeley. Editor of The Encyclopedia of Electronics.*

CAVENDISH, HENRY (in part) (Micropædia)

Ch.Su. Christine Sutton. *Science writer. Research Associate, Department of Nuclear Physics, University of Oxford. Author of The Particle Connection; Spaceship Neutrino.*

ARGONNE NATIONAL LABORATORY (Micropædia)

COLLIDING-BEAM STORAGE RING (Micropædia)

DESY (Micropædia)

ELECTROWEAK THEORY (Micropædia)

FERMI NATIONAL ACCELERATOR

LABORATORY (Micropædia)

FEYNMAN DIAGRAM (in part) (Micropædia)

FLAVOUR (Micropædia)

GLUON (Micropædia)

HIGGS PARTICLE (Micropædia)

LINEAR ACCELERATOR (Micropædia)

PARTICLE ACCELERATORS (in part)

QUANTUM CHROMODYNAMICS (Micropædia)

RENORMALIZATION (Micropædia)

SLAC (Micropædia)

STANDARD MODEL (Micropædia)

STRONG NUCLEAR FORCE (Micropædia)

SUBATOMIC PARTICLES

SUPERGRAVITY (Micropædia)

SUPERSTRING THEORY (Micropædia)

SUPERSYMMETRY (Micropædia)

TAU (Micropædia)

UNIFIED FIELD THEORY (Micropædia)

WEAK NUCLEAR FORCE (Micropædia)

Z PARTICLE (Micropædia)

C.H.T. Charles Henri Toupet. *Emeritus Professor of Tropical Geography, University of Lyon III. Author of Étude du milieu physique de massif de l'Assaba, Mauritanie and others.*

WESTERN AFRICA (in part)

C.Hu. Charles Y. Hu. *Former Professor of Geography, University of Maryland, College Park. Author of monographs on the military geography of China.*

CHINA (in part)

C.H.V.S. Carol Humphrey Vivian Sutherland (d. 1986). *Student of Christ*

Church, Oxford, 1945–75; Keeper of the Heberden Coin Room, Ashmolean Museum, University of Oxford, 1957–75. Author of Roman Coins and others.

COINS AND COINAGE (in part)

C.H.W. Conrad H. Waddington (d. 1975). *Buchanan Professor of Genetics, University of Edinburgh, Scotland, 1947–75. Author of Principles of Embryology.*

GROWTH AND DEVELOPMENT, BIOLOGICAL (in part)

C.H.Wi. Charles Henry Wilson (d. 1991). *Professor of Modern History, University of Cambridge, 1965–79; Fellow of Jesus College, Cambridge, 1938–91. Author of Anglo-Dutch Commerce and Finance in the Eighteenth Century and others.*

MAURICE (NETHERLANDS) (Micropædia)

C.I. Charles Issawi. *Bayard Dodge Professor Emeritus of Near Eastern Studies, Princeton University. Author of An Arab Philosophy of History and others.*

IBN KHALDŪN (Micropædia)

C.I.C. Carleton Ivers Calkin. *Painter and restorer. Curator, Historic St. Augustine Preservation Board, Florida, 1966–73.*

SCULPTURE, THE HISTORY OF WESTERN (in part)

C.I.C.-M. Celia I. Campbell-Mohn. *Professor of Law, Vermont Law School, South Royalton. Editor of Sustainable Environmental Law: Integrating Natural Resource and Pollution Abatement Law from Resources to Recovery.*

ENVIRONMENTALISM AND ENVIRONMENTAL LAW (in part)

C.-i.M. Chung-in Moon. *Dean, Graduate School of International Studies, Yonsei University, Seoul, South Korea. Author of Arms Control on the Korean Peninsula: Domestic Perceptions, Regional Dynamics, and International Penetrations; coauthor of Alliance under Tension: The Evolution of South Korean-U.S. Relations.*

ASIA-PACIFIC ECONOMIC COOPERATION (Micropædia)

C.J.A. Charles Joseph Adams. *Emeritus Professor of Islamic Studies, McGill University, Montreal. Editorial Board, Encyclopaedia of Religion. Editor of A Reader's Guide to the Great Religions.*

RELIGIONS, THE STUDY AND CLASSIFICATION OF (in part)

C.J.Al. Constantine John Alexopoulos (d. 1986). *Professor of Botany, University of Texas at Austin, 1962–77. Author of Introductory Mycology.*

FUNGI (in part)

C.J.B. Colin J. Bundy. *Professor of History; Director, Institute of Historical Research, University of the Western Cape, Bellville, South Africa. Author of Rise and Fall of the South African Peasantry.*

SOUTHERN AFRICA (in part)

C.J.D. Cornelius J. Dyck. *Emeritus Professor of Anabaptist and Sixteenth-Century Studies, Mennonite Biblical Seminary, Elkhart, Indiana. Editor of A Legacy of Faith; An*

Introduction to Mennonite History and others.

MENNO SIMONS (Micropædia)

C.J.F.D. Charles James Frank Dowsett. *Calouste Gulbenkian Professor of Armenian Studies, University of Oxford; Fellow of Pembroke College, Oxford. Translator (with commentary) of Movses Dasxuranci's The History of the Caucasian Albanians and others.*

TRANSCAUCASIA (in part)

C.J.Ga. Cyril John Gadd (d. 1969). *Professor of Ancient Semitic Languages and Civilizations, University of London, 1955–60. Keeper, Egyptian and Assyrian Antiquities, British Museum, London, 1948–55.*

SYRIA (in part)

C.J.L.P. Cecil John Layton Price. *Emeritus Professor of English Language and Literature, University College of Swansea, University of Wales.*

SHERIDAN, RICHARD BRINSLEY (Micropædia)

C.J.Mo. Cyril John Morley. *Former Honorary Secretary, British Falconers' Club and International Association of Falconry and Conservation of Birds of Prey.*

FALCONRY (in part) (Micropædia)

C.Jo. Charles Joys. *Coauthor of Vart folks historie.*

NORWAY (in part)

C.J.R. Cornelis Jord Ruijgh. *Professor of Ancient Greek Linguistics, University of Amsterdam, 1969–95. Author of Études sur la grammaire et le vocabulaire du grec mycénien.*

LANGUAGES OF THE WORLD (in part)

C.J.W. Christopher John Wickham. *Professor of Early Medieval History, University of Birmingham, England. Author of Early Medieval Italy: Central Power and Local Society, 400–1000 and others.*

ITALY (in part)

C.K. Cornelis Klein. *Professor of Earth and Planetary Sciences, University of New Mexico, Albuquerque. Author of Minerals and Rocks; coauthor of Manual of Mineralogy.*

MINERALS AND ROCKS (in part)

C.K.B. C.K. Bertram. *President, Lucy Cavendish College, University of Cambridge, 1970–79.*

MAMMALS (in part)

C.-K.L. Chi-Keung Leung. *Director, Hong Kong Institute of Education. Editor, Asian Geographer. Author of China: Railway Patterns and National Goals.*

CHINA (in part)

HONG KONG (in part)

C.K.N.P. C. Kumar N. Patel. *Vice-Chancellor for Research, University of California, Los Angeles. Executive Director of Research, Materials Science, Engineering and Academic Affairs Division, AT&T Bell Laboratories, Murray Hill, New Jersey, 1987–93. Author of numerous papers on electronics and optics.*

MATERIALS SCIENCE (in part)

C.K.S. Carl Keenan Seyfert. *Professor of Geology, State University of New York*

College at Buffalo. Coauthor of Earth History and Plate Tectonics.
EARTH, THE (in part)

C.K.So. *Cornelia K. Sorabji. Senior Research Analyst, Foreign and Commonwealth Office of the United Kingdom, London.*
BALKAN STATES (in part)

C.K.St. *Christian Karlson Stead. Emeritus Professor of English, University of Auckland, New Zealand. Author of In the Glass Case: Essays on New Zealand Literature and others.*

AUSTRALIA AND NEW ZEALAND, LITERATURES OF (in part)

C.L.C. *C. Lockard Conley, M.D. Distinguished Service Professor Emeritus of Medicine, Johns Hopkins University and Hospital, Baltimore, Maryland; Head, Hematology Division, 1947–80. Contributor to Medical Physiology.*
BLOOD (in part)

C.L.Cl. *C.L. Cline. Ashbel H. Smith Professor Emeritus of English, University of Texas at Austin. Author of Byron, Shelley, and Their Pisan Circle; editor of The Letters of George Meredith.*
MEREDITH, GEORGE (Micropædia)

C.Le. *Chan Lee. Emeritus Professor of Geography, Seoul National University, South Korea.*
KOREA (in part)
SEOUL

C.L.F. *Charles L. Fefferman. Professor of Mathematics, Princeton University.*
ANALYSIS (IN MATHEMATICS) (in part)

C.L.Ha. *C. Lowell Harriss. Emeritus Professor of Economics, Columbia University. Coauthor of American Public Finance and others.*
TAXATION (in part)

C.Li. *Chan Lien. Professor of Political Science, National Taiwan University, Taipei. Coauthor of Taiwan: From Pre-history to Modern Times.*
HU SHIH (Micropædia)

C.L.K. *Charlotte L. Kellner. Former Lecturer in Physics, Imperial College of Science and Technology, University of London. Author of Alexander von Humboldt.*

HUMBOLDT, ALEXANDER VON (Micropædia)

Cl.L. *Clifford Leech. (d. 1977). Professor of English, University of Toronto, 1963–74. Author of The Dramatist's Experience with Other Essays in Critical Theory; editor of Marlowe: A Collection of Critical Essays.*
JONSON, BEN (in part) (Micropædia)
MARLOWE, CHRISTOPHER (in part) (Micropædia)

C.L.Ma. *Clyde L. Manschreck. Chavanne Professor of Religious Studies, Rice University, Houston, Texas. Emeritus Professor of the History of Christianity, Chicago Theological Seminary. Editor of Melanchthon on Christian Doctrine.*
MELANCHTHON, PHILIPP (Micropædia)

C.Lo. *Constance Lowenthal. Executive Director, International Foundation for Art Research, New York City.*
GHIBERTI, LORENZO (Micropædia)

C.L.P.II. *Charles Lafayette Proctor II. Associate Professor of Mechanical Engineering, University of Florida, Gainesville.*
ENERGY CONVERSION (in part)

C.L.Q. *Charles Loreaux Quittmeyer. Floyd Dewey Gottwald Professor Emeritus of Business Administration, College of William and Mary, Williamsburg, Virginia. Author of The Virginia Travel Trade and others.*

UNITED STATES OF AMERICA (in part)

C.L.R.J. *C.L.R. James (d. 1989). Star Professor of History, University of the District of Columbia, Washington, D.C., 1970–80. Secretary, West Indian Federal Labor Party, 1958–62. Author of The Black Jacobins.*

WEST INDIES, THE (in part)

C.L.T. *Carol Lewis Thompson. Editor, Current History, Philadelphia, 1955–91.*
UNITED STATES OF AMERICA (in part)

C.M. *Christopher Marriage Marsh (deceased). Special Engineering Adviser, British Waterways Board, 1964–66; North Western Divisional Manager, 1948–64. Author of many papers on waterways.*
PUBLIC WORKS (in part)

C.Ma. *Carleton Mabee. Emeritus Professor of History, State University of New York College at New Paltz. Author of The American Leonardo: A Life of Samuel F.B. Morse.*
MORSE, SAMUEL F.B. (Micropædia)

C.M.A. *Sister Consuelo Maria Aherne. Professor of History, Chestnut Hill College, Philadelphia. Assistant staff editor of Mediaeval Church History; contributor to the New Catholic Encyclopedia.*
BONIFACE, SAINT (Micropædia)

C.McH. *Christine McHugh. Attorney. Associate, Pelletieri, Rabstein, and Altman, Princeton, New Jersey.*
ADAMS, HENRY (Micropædia)

C.M.E. *Chester Monroe Edelman, Jr., M.D. Professor of Pediatrics; Senior Associate Dean and Associate Dean for Clinical Affairs, Albert Einstein College of Medicine, Yeshiva University, Bronx, New York. Editor of Pediatric Kidney Disease.*

CHILDHOOD DISEASES AND DISORDERS (in part)

C.-M.H. *Chiao-Min Hsieh. Professor of Geography, University of Pittsburgh, Pennsylvania. Author of China: A Geography in Perspective and others.*
CHINA (in part)

C.M.K. *Cecelia M. Kenyon (d. 1990). Clarke Professor of Government, Smith College, Northampton, Massachusetts, 1969–84. Editor of The Antifederalists.*
JEFFERSON

C.M.L. *Cecelia M. Lynch. Assistant Professor of Political Science, Northwestern University, Evanston, Illinois.*
UNITED NATIONS (in part)

C.M.-L. *Carmelo Mesa-Lago. Distinguished Service Professor of Economics and Latin-American Studies,*

University of Pittsburgh. Author of Cuba After the Cold War and others.
WEST INDIES, THE (in part)

C.M.Lo. *Clara M. Lovett. President, Northern Arizona University, Flagstaff. Author of The Democratic Movement in Italy, 1830–1876 and others.*
ITALY (in part)

C.M.N. *C.M. Naim. Associate Professor of Urdu, University of Chicago. Editor, Annual of Urdu Studies.*
SOUTH ASIAN ARTS (in part)

C.M.Wi. *C. Martin Wilbur. George Sansom Professor Emeritus of Chinese History, Columbia University. Author of The Nationalist Revolution in China, 1923–1928 and others.*
CHINA (in part)

C.M.Wo. *Christopher Montague Woodhouse. Member of Parliament for Oxford, 1959–66, 1970–74. Author of The Story of Modern Greece and others; coauthor of Rhodes.*
RHODES, CECIL (in part) (Micropædia)

C.N.B. *Cyril Nelson Barclay (d. 1979). Brigadier, The Cameronians (Scottish Rifles). Editor, The Army Quarterly and Defence Journal, 1950–66; coeditor, Brassey's Annual: The Armed Forces Year Book, 1950–69.*
MOLTKE, HELMUTH VON (Micropædia)

C.N.C. *Charles N. Cofer. Research Professor of Psychology, University of North Carolina at Chapel Hill. Lecturer in Psychology, Duke University, Durham, North Carolina. Author of Human Motivation: A Guide to Information Sources and others.*
MOTIVATION, HUMAN (in part)

C.N.Ca. *Cesar N. Caviedes. Professor and Chairman, Department of Geography, University of Florida, Gainesville. Author of The Politics of Chile and others.*
CHILE (in part)

C.N.M. *Charles Nicholas Morris. Executive Director, London Economics. Former Deputy Director, Institute for Fiscal Studies, London. Coauthor of The Reform of Social Security.*
GOVERNMENT FINANCE (in part)

C.O. *Carola Oman (Lady Lenanton) (d. 1978). Biographer. Author of David Garrick and others.*
GARRICK, DAVID (Micropædia)

C.O.Hu. *Charles O. Hucker. Emeritus Professor of Chinese and of History, University of Michigan, Ann Arbor. Author of The Traditional Chinese State in Ming Times and others.*
CHINA (in part)
YUNG-LO (Micropædia)

Co.L. *Colin Legum. Associate Editor, The Observer, London, 1949–82; Editor, Africa Contemporary Record, 1968–83. Author of Pan-Africanism and others.*
SOUTHERN AFRICA (in part)

C.P. *Colin Patterson. Curator of Fossil Fishes, British Museum (Natural History), London. Coeditor of Fossil Vertebrates.*
FISHES (in part)

C.P.D. Carlos Pablo Dubois. *Chief of Secretariat Services, International Coffee Organization, London.*

URUGUAY (in part)

C.Pe. Chaim Perelman (d. 1984). *Professor of Logic and Ethics, Free University of Brussels. Author of The New Rhetoric and others.*

RHETORIC (in part)

C.Pf. Carl Pfaffmann (d. 1994). *Vincent and Brooke Astor Professor of Physiological Psychology, Rockefeller University, New York City, 1980–83. Editor of Olfaction and Taste, proceedings of the Third International Symposium on Olfaction and Taste.*

SENSORY RECEPTION (in part)

C.P.F. Charles Patrick FitzGerald (d. 1992). *Professor of Far Eastern History, Australian National University, Canberra, 1953–67. Author of Son of Heaven (T'ang T'ai Tsung); The Empress Wu; and others.*

T'AI TSUNG (T'ANG DYNASTY) (Micropædia)
WU HOU (Micropædia)

C.P.G. Colin Peter Groves. *Reader in Biological Anthropology, Australian National University, Canberra. Author of A Theory of Human and Primate Evolution and others.*

BIOSPHERE AND CONCEPTS OF ECOLOGY, THE

(in part)

C.Ra. Chakravarthi Raghavan. *Geneva Representative, Third World Network, Penang, Malaysia. Chief Editor, South-North Development Monitors newsletter, Geneva.*

BOMBAY
INDIA (in part)

C.R.B. Charles R. Bawden. *Emeritus Professor of Mongolian, University of London. Author of The Modern History of Mongolia.*

GENGHIS KHAN
KUBLAI KHAN (Micropædia)

C.R.C. Clark R. Chapman. *Senior Scientist, Planetary Science Institute, San Juan Institute, Tucson, Arizona. Author of Cosmic Catastrophes and others.*

SOLAR SYSTEM, THE (in part)

C.R.G. C. Robin Ganellin. *Professor of Medicinal Chemistry, University College, University of London. Coeditor of Frontiers in Histamine Research.*

DRUGS AND DRUG ACTION (in part)

C.R.H. Campbell Ronald Harler (deceased). *Adviser on tea to the Central Treaty Organization. Author of The Culture and Marketing of Tea.*

FARMING AND AGRICULTURAL TECHNOLOGY (in part)

C.R.N. Charles R. Noback. *Emeritus Professor of Anatomy and Cell Biology, College of Physicians and Surgeons, Columbia University. Coauthor of The Human Nervous System and others.*

NERVES AND NERVOUS SYSTEMS (in part)

C.R.No. Carl R. Noller (d. 1980). *Professor of Chemistry, Stanford University, California. Author of Chemistry of Organic Compounds.*

CHEMICAL COMPOUNDS (in part)

C.Ro. Christopher Robinson. *Official Student in Modern Languages, Christ Church, University of Oxford. Author of French Literature in the 19th Century and others.*

FRENCH LITERATURE (in part)

C.R.R. Charles R. Russell. *Consulting engineer. Former Professor of Mechanical Engineering, California Polytechnic State University, San Luis Obispo. Author of Elements of Energy Conversion.*

ENERGY CONVERSION (in part)

C.R.S. C. Ronald Seeger (deceased). *Professor of Geology and Geophysics, Western Kentucky University, Bowling Green. Author of Problems for Exploration Geophysics.*

CONTINENTAL LANDFORMS (in part)

C.R.T. Charles Rowland Twidale. *Reader in Geology and Geophysics, University of Adelaide, Australia. Author of Geomorphology with Special Reference to Australia and others.*

AUSTRALIA (in part)

GEOMORPHIC PROCESSES (in part)

C.S. Calambur Sivaramamurti. *Director, National Museum of India, New Delhi, 1966–69, 1971–75; Hony Adviser on Museums, Government of India, 1969–70. Author of Indian Sculpture and others.*

SOUTH ASIAN ARTS (in part)

C.S.III. Charles Scribner III. *Editor, Scribner (publisher), New York City. Author of Peter Paul Rubens and many others.*

RUBENS, PETER PAUL (Micropædia)

C.Sa. Claudio Sartori (d. 1994). *Chief, Office of Research and Indexing of the Italian Musical Funds, Braidense National Library, Milan. Author of Puccini and others.*

PUCCINI, GIACOMO (Micropædia)

C.S.Br. C.S. Breed. *Geologist, Geological Survey, U.S. Department of the Interior, Flagstaff, Arizona. Coauthor of Landscapes of Arizona: The Geological Story.*

CONTINENTAL LANDFORMS (in part)

C.S.C. Christopher S. Campbell. *Professor of Plant Systematics, University of Maine, Orono. Coeditor of Grass Systematics and Evolution.*

ANGIOSPERMS (in part)

C.-S.Ch. Cheng-Siang Chen. *Former Professor of Geography; former Director, Geographical Research Center, Chinese University of Hong Kong. Author of Taiwan: An Economic and Social Geography and several reports on Hong Kong.*

CHINA (in part)

C.Se. Charles Seymour (d. 1963). *President, Yale University, 1937–50; Professor of History, 1918–37. Author of Woodrow Wilson and the World War.*

WILSON, WOODROW (in part) (Micropædia)

C.S.F. Catherine S. Fowler. *Professor of Anthropology, University of Nevada, Reno. Author of Great Basin Anthropology: A Bibliography.*

AMERICAN PEOPLES, NATIVE (in part)

C.S.G.P. Courtenay Stanley Goss Phillips. *Lecturer in Inorganic Chemistry, University of Oxford; Fellow of Merton College, Oxford. Coauthor of Inorganic Chemistry.*

CHEMICAL ELEMENTS (in part)

C.S.Ha. Craig S. Harbison. *Professor of Art History, University of Massachusetts at Amherst. Author of The Last Judgment in Sixteenth Century Northern Europe and others.*

GRÜNEWALD, MATTHIAS (Micropædia)
HOLBEIN, HANS, THE YOUNGER (Micropædia)

C.S.J. Christopher Stewart Jackson. *Former Senior Lecturer in English, University of the West Indies, Cave Hill, Barbados.*

WEST INDIES, THE (in part)

C.Sm. Colin Smethurst. *Marshall Professor of French, University of Glasgow, Scotland. Author of Émile Zola, Germinal.*

FRENCH LITERATURE (in part)

C.Sn. Carl Sagan (d. 1996). *Director, Laboratory for Planetary Studies, 1968–96; David Duncan Professor of Astronomy, Cornell University, Ithaca, New York, 1977–96. Author of The Dragons of Eden: Speculations on the Evolution of Human Intelligence; Cosmos; and others.*

LIFE (in part)

C.S.Sh. Caroline Sarah Shaw. *Legal clerk. Researcher on Cape Verde.*

WESTERN AFRICA (in part)

C.Su. Chusei Suzuki. *Professor of Asian History, Aichi University, Toyohashi, Japan. Author of A Study of Mid-Ch'ing History.*

CHINA (in part)

C.S.Wh. Charles S. Whewell (d. 1995). *Emeritus Professor of Textile Industries, University of Leeds, England, 1963–77.*

INDUSTRIES, TEXTILE (in part)

C.S.-y. Chuang Shang-yen (d. 1980). *Deputy Director, National Palace Museum, Taipei, Taiwan.*

MI FEI (Micropædia)

C.-t.C. Chen-tung Chang. *Senior Lecturer in Sociology, National University of Singapore. Author of Fertility Transition in Singapore.*

CHINA (in part)

C.T.Mo. Charles Thomas Morrissey. *Director, Oral History and Archives Project, Baylor College of Medicine, Houston, Texas. Editor, Vermont History, 1966–71 and 1973–76, and Vermont Life, 1982–83. Author of Vermont: A Bicentennial History.*

UNITED STATES OF AMERICA (in part)

C.T.R. C.T. Ritchie. *Historian, writer, and artist. Author of The First Canadian: The Story of Champlain and others.*

CHAMPLAIN, SAMUEL DE (Micropædia)

C.T.W. Cheves T. Walling. *Distinguished Professor Emeritus of Chemistry, University of Utah, Salt Lake City. Author of Free Radicals in Solution.*

RADICAL (in part) (Micropædia)

C.T.Wa. Chun Tsin Wang. *Former Senior Research Metallurgist, Teledyne*

Wah Chang Albany, Oregon. Coauthor of Tungsten: Sources, Metallurgy, Properties, and Applications.

INDUSTRIES, EXTRACTION AND PROCESSING (in part)

C.V.B. Clinton V. Black. *Archival adviser, Government of Jamaica; former Archivist, Jamaica Archives, Spanish Town. Author of The History of Jamaica and others.*

WEST INDIES, THE (in part)

C.v.d.K. C. van de Kieft. *Emeritus Professor of Medieval History, University of Amsterdam. Coauthor of 500 Jaren Staten-Generaal in de Nederlanden.*

NETHERLANDS, THE (in part)

C.V.-F. Claudio Vita-Finzi. *Professor of Neotectonics, University College, University of London. Author of Recent Earth History; Recent Earth Movements.*

GEOMORPHIC PROCESSES (in part)

C.V.N. Chakravarthi V. Narasimhan. *Senior Fellow, United Nations Institute for Training and Research, New York City; Under-Secretary-General for Inter-Agency Affairs and Coordination, United Nations, 1973–78. Author of The United Nations: An Inside View and others.*

ASIA (in part)

C.V.W. Dame C.V. Wedgwood (d. 1997). *Freelance writer and historian. Fellow, University College, University of London, 1965–97. Author of Thomas Wentworth, First Earl of Strafford, 1593–1641: A Reevaluation and others.*

STRAFFORD, THOMAS WENTWORTH, 1ST EARL OF (Micropædia)

C.W. Claus Westermann. *Professor of Old Testament Exegesis, Rupert Charles University of Heidelberg. Author of Handbook to the Old Testament.*

SACRED OFFICES AND ORDERS (in part)

C.W.A. Charles W. Arnade. *Distinguished Professor of International Studies and History, University of South Florida, Tampa. Author of The Emergence of the Republic of Bolivia and others.*

BOLIVIA (in part)

C.W.B. Curt W. Beck. *Research Professor of Chemistry, Vassar College, Poughkeepsie, New York.*

STAHL, GEORG ERNST (Micropædia)

C.W.Br. C.W. Bracewell. *Senior Lecturer in History, School of Slavonic and East European Studies, University of London. Author of The Uskoks of Senj: Banditry, Piracy and Holy War in the Sixteenth-Century Adriatic.*

BALKAN STATES (in part)

C.W.F. Charles W. Freeman. *Former U.S. Ambassador to the Kingdom of Saudi Arabia (1989–92) and Assistant U.S. Secretary of Defense. Chairman of Projects International, Inc. Author of Arts of Power: Statecraft and Diplomacy; The Diplomat's Dictionary; and others.*

DIPLOMACY (in part)

C.W.G. Carol W. Gelderman. *Distinguished Professor of English, University of New Orleans. Author of Henry Ford, the Wayward Capitalist and others.*

FORD, HENRY (in part)

C.W.Ge. Charles William Gear. *President, NEC Research Institute, Princeton, New Jersey. Professor of Computer Science, University of Illinois at Urbana-Champaign, 1962–90. Author of Numerical Initial Value Problems for Ordinary Differential Equations and others.*

NUMERICAL ANALYSIS

C.W.H. Charles W. Hayford. *Associate, Department of History, Northwestern University, Evanston, Illinois, and Center for East Asian Studies, University of Chicago.*

LIN TSE-HSÜ (Micropædia)

C.W.Ho. C. Warren Hollister. *Professor of History, University of California, Santa Barbara. Author of The Impact of the Norman Conquest and others.*

HENRY I (ENGLAND) (Micropædia)

C.W.J. C. Wilfred Jenks (d. 1973). *Director General of the International Labour Office, Geneva, Switzerland, 1970–73. Author of Human Rights and International Labour Standards.*

BUSINESS LAW (in part)

C.W.M. C.W. Minkel. *Associate Vice-Chancellor; Dean, Graduate School, University of Tennessee, Knoxville. Coauthor of Latin America.*

CARACAS (in part)

SÃO PAULO (in part)

SOUTH AMERICA (in part)

C.W.P. Clifton W. Pannell. *Associate Dean, College of Arts and Sciences; Professor of Geography, University of Georgia, Athens. Coauthor of China: Geography of Development and Modernization; editor of East Asia: Historical and Geographical Approaches to Foreign Area Studies.*

ASIA (in part)

C.W.Pa. Charles William Parkin (deceased). *Fellow and Lecturer of Clare College, University of Cambridge. Author of The Moral Basis of Burke's Political Thought.*

BURKE, EDMUND (in part) (Micropædia)

C.W.S. Clyde William Sanger. *Director of Communications, North-South Institute, Ottawa. Director of Information, Commonwealth Secretariat, London, 1977–79. Author of Central African Emergency.*

SOUTHERN AFRICA (in part)

C.W.T. Charlton W. Tebeau. *Emeritus Professor of History, University of Miami, Coral Gables, Florida. Author of A History of Florida.*

JACKSON, THOMAS JONATHAN (Micropædia)
SHERMAN, WILLIAM TECUMSEH (in part) (Micropædia)

C.Y. Chiang Yee (d. 1977). *Painter. Professor of Chinese, Columbia University, 1968–71. Author of Chinese Calligraphy and others.*

WRITING (in part)

C.-y.C. Chu-yuan Cheng. *Professor of Economics, Ball State University, Muncie, Indiana. Consultant, National Science Foundation, Washington, D.C. Author of*

China's Economic Development and others.

CHINA (in part)

Cy.Do. Cyril Domb. *Emeritus Professor of Physics, Bar Ilan University, Ramat Gan, Israel. Editor of Clerk Maxwell and Modern Science.*

MAXWELL

C.-y.H. Cho-yun Hsu. *University Professor of History and Sociology, University of Pittsburgh. Author of History of Western Chou Civilization.*

CHINA (in part)

D.A. Dudley Andrew. *Professor of Communication Studies and of Comparative Literature; Director, Institute for Cinema and Culture, University of Iowa, Iowa City. Author of Film in the Aura of Art and others.*

MOTION PICTURES (in part)

Da.B. David Brody. *Emeritus Professor of History, University of California, Davis. Author of Workers in Industrial America: Essays on the Twentieth Century Struggle and others.*

WORK AND EMPLOYMENT (in part)

D.A.B. Dirk Anthony Ballendorf. *Professor of History and Micronesian Studies, University of Guam. Coeditor of Oceania Today: Towards New Directions and Political Self-Actualization.*

PACIFIC ISLANDS (in part)

Da.Br. David Brown. *Emeritus Professor of Musicology, University of Southampton, England. Author of Mikhail Glinka; Tchaikovsky; and others.*

SHOSTAKOVICH, DMITRY (in part) (Micropædia)

Da.Bro. David Broughton. *Lecturer in Politics, School of European Studies, University of Wales, Cardiff. Author of Public Opinion Polling and Politics in Britain and others.*

PLAID CYMRU (Micropædia)

SCOTTISH NATIONAL PARTY (Micropædia)

D.A.C. David A. Cook. *Professor and Director of Film Studies Program, Emory University, Atlanta, Georgia. Author of A History of Narrative Film.*

MOTION PICTURES (in part)

Da.C.J. David C. Joy. *Distinguished Professor of Zoology, University of Tennessee, Knoxville. Distinguished Scientist, Oak Ridge National Laboratory, Tennessee; Director, Electron Microscopy Facility. Coeditor of Principles of Analytical Electron Microscopy.*

MICROSCOPES (in part)

Da.D. David Dooling, Jr. *Aerospace writer and consultant. Former Science Editor, The Huntsville (Alabama) Times. Coauthor of Space Travel: A History.*

EXPLORATION (in part)

Da.E.B. David E. Borth. *Manager, Communication Systems Research Laboratory, Corporate Research Laboratories, Motorola Inc., Schaumburg, Illinois. Coauthor of Introduction to Spread Spectrum Communications.*

TELECOMMUNICATIONS SYSTEMS (in part)

D.A.E.S. David A.E. Spalding. *Series Editor, Altitude Nature Guides. Former Head Curator of Natural History, Provincial Museum of Alberta, Edmonton. Senior editor of A Nature Guide to Alberta.*
CANADA (in part)

Da.G.S. David G. Scanlon (d. 1990). *Professor of International Education, Columbia University. Editor of Traditions of African Education and others.*
EDUCATION, HISTORY OF (in part)

D.A.H. Donald August Holm. *Senior Geologist, Arabian American Oil Company, Dhahran, Saudi Arabia, 1946–61. Author of "Desert Geomorphology of the Arabian Peninsula" in Science magazine.*
ASIA (in part)

D.A.He. D. Alan Heslop. *Director, Rose Institute of State and Local Government, Claremont McKenna College, California. Editor of Californians in Congress.*
POLITICAL SYSTEMS (in part)

D.A.K.B. Sir Douglas A.K. Black, M.D. *Emeritus Professor of Medicine, Victoria University of Manchester, England; Physician, Manchester Royal Infirmary, 1959–77. Editor of Renal Disease.*
EXCRETION AND EXCRETORY SYSTEMS (in part)

Da.Ke. Dave Kehr. *Film Columnist, The New York Times. Vice President, FIPRESCI, international film critics union. Former Chief Film Critic, Chicago Tribune; New York Daily News.*
ANIMATION (Micropædia)

D.A.Lo. D. Anthony Low. *Smuts Professor of Commonwealth History, University of Cambridge. Author of Buganda in Modern History.*
EASTERN AFRICA (in part)

D.A.McQ. Donald A. McQuarrie. *Professor of Chemistry, University of California, Davis. Author of Statistical Mechanics and others.*
THERMODYNAMICS, PRINCIPLES OF (in part)

D.An. Donald M. Anderson. *Emeritus Professor of Art, University of Wisconsin, Madison. Author of The Art of Written Forms.*
WRITING (in part)

D.Ar. Daniel Argov. *Former Lecturer in Modern Indian History, Institute of Asian and African Studies, Hebrew University of Jerusalem. Author of Moderates and Extremists in the Indian Nationalist Movement, 1883–1920.*
PATEL, VALLABHBHAI JHAVERBHAI (Micropædia)

D.A.Sa. Dawlat Ahmed Sadek. *Chairman of the Geography Department, Faculty of Arts, Ain Shams University, Cairo.*
ARABIA (in part)

D.At. Donald Attwater (d. 1977). *Author of Penguin Dictionary of Saints; St. John Chrysostom, Pastor and Preacher.*
CHRYSOSTOM, SAINT JOHN (Micropædia)

D.A.T. David A. Thomas. *Reader in Criminal Justice, University of Cambridge;*

Fellow of Trinity Hall, Cambridge. Author of Principles of Sentencing.

CRIME AND PUNISHMENT (in part)

Da.W. David Watts. *Dean, School of Earth Resources, University of Hull, England. Author of The West Indies Patterns of Development and others.*
WEST INDIES, THE (in part)

D.B. Douglas Bush (d. 1983). *Gurney Professor of English Literature, Harvard University, 1957–66. Author of Paradise Lost in Our Time and others.*
MILTON (in part)

D.Ba. D. Banzragch (deceased). *Scientific Secretary, Institute of Biology, Academy of Sciences, Ulaanbaatar, Mongolia.*
MONGOLIA (in part)

D.B.C. David B. Chan. *Professor of History, California State University, Hayward. Author of The Usurpation of the Prince of Yen, 1382–1402.*
HUNG-WU (Micropædia)

D.B.E. David Barnard Ericson. *Research Staff Scientist, Lamont-Doherty Geological Observatory, Columbia University, 1964–73. Coauthor of The Ever-Changing Sea.*
ATLANTIC OCEAN, THE (in part)

D.B.En. David B. Enfield. *Research Oceanographer, Atlantic Oceanographic and Meteorological Laboratory, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Miami.*
EL NIÑO (Micropædia)
OCEANS (in part)

D.Bev. David Bevington. *Phyllis Fay Horton Distinguished Service Professor in the Humanities, University of Chicago. Author of Action Is Eloquence: Shakespeare's Language of Gesture; editor of The Complete Works of Shakespeare and other Shakespeare titles.*
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D.B.-G. David Ben-Gurion (d. 1973). *Prime Minister and Minister of Defense, Government of Israel, 1948–53, 1955–63. Author of The Struggle and others.*
HERZL, THEODOR (Micropædia)

D.B.H. Dwight B. Heath. *Professor of Anthropology, Brown University, Providence, Rhode Island. Editor of Contemporary Cultures and Societies of Latin America.*
AMERICAN PEOPLES, NATIVE (in part)

D.Bi. David Birmingham. *Professor of Modern History, University of Kent at Canterbury, England. Author of Trade and Conflict in Angola and others.*
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WESTERN AFRICA (in part)

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D.Bo. Doug Booth. *Senior Lecturer, University of Otago, Dunedin, New Zealand. Author of numerous works on the history and sociology of surfing.*

SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

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D.B.S. David B. Stewart. *Research Geologist, Geological Survey, U.S. Department of the Interior, Washington, D.C.*
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D.B.So. David B. Solnit. *Assistant Professor of Thai Language and Literature, University of Michigan, Ann Arbor, 1988–95. Author of Eastern Kayah Li: Grammar, Texts, Glossary.*
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D.Bu. David Bushnell. *Emeritus Professor of History, University of Florida, Gainesville. Author of The Making of Modern Colombia: A Nation in Spite of Itself and others.*
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D.D. David Diringer (d. 1975). *Reader in Semitic Epigraphy, University of Cambridge, 1966–68. Founder and Director, Alphabet Museum, Tel Aviv, Israel. Author of The Alphabet.*
WRITING (in part)

D.Da. David Daiches. *Emeritus Professor of English, University of Sussex, Brighton, England. Author of Robert Burns; Robert Burns and His World; R.L. Stevenson and His World.*
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STEVENSON, ROBERT LOUIS (Micropædia)

D.D.B. Dimitry Dimitriyevich Blagoy (d. 1984). *Professor and Head, Department of Modern Russian Literature, Institute of World Literature, Academy of Sciences of the U.S.S.R., Moscow. Author of Tvorchesky put Pushkina and others.*
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CRAIG, EDWARD GORDON (in part) (Micropædia)

D.E.B. D. E. Berlyne (d. 1976). *Professor of Psychology, University of Toronto. Author of Structure and Direction in Thinking.*
THOUGHT AND THOUGHT PROCESSES (in part)

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ANGIOSPERMS (in part)

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ABELARD, PETER (Micropædia)

De.M.S. Denis Mack Smith. *Extraordinary Fellow, Wolfson College, University of Oxford; Senior Research Fellow, All Souls College, Oxford, 1962–87. Author of Garibaldi; editor of Garibaldi.*
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MUSICAL FORMS AND GENRES (in part)

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MELVILLE, HERMAN (in part) (Micropædia)

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BRUCKNER, ANTON (Micropædia)

DeW.C.R. DeWitt C. Reddick (d. 1980). *Jesse H. Jones Professor of Journalism and Education, University of Texas at Austin, 1970–75.*
UNITED STATES OF AMERICA (in part)

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PINDAR (Micropædia)

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SLEEP AND DREAMS (in part)

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ADDISON, JOSEPH (in part) (Micropædia)

D.F.Br. Deborah Fahy Bryceson. *Research Fellow, African Studies Centre, State University of Leiden, The Netherlands. Author of Liberalizing Tanzania's Food Trade and others.*
EASTERN AFRICA (in part)

D.F.Do. Douglas F. Dowd. *Professor of Economics, San Jose State University, California. Professorial Lecturer in International Economics, John Hopkins University School of Advanced Studies, Bologna Center, Italy.*
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D.F.E. **The Rev. Donald Fyfe Easton.** *Freelance archaeologist.*

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BIBLICAL LITERATURE AND ITS CRITICAL INTERPRETATION (*in part*)

D.F.R. **Dale F. Ritter.** *Executive Director, Quaternary Sciences Center, Desert Research Institute, University and Community College System of Nevada, Reno. Author of Process Geomorphology. Rivers (*in part*)*

D.F.S. **D.F. Shriver.** *Morrison Professor of Chemistry, Northwestern University, Evanston, Illinois. Coauthor of Inorganic Chemistry and others.*

CHEMICAL COMPOUNDS (*in part*)

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CENTRAL AMERICA (*in part*)

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TAINÉ, HIPPOLYTE (*Micropædia*)

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GERMAN LITERATURE (*in part*)

D.Ge. **Deno John Geanakoplos.** *Professor of History and Religious Studies, Yale University. Author of Emperor Michael Palaeologus and the West.*

MICHAEL VIII PALAEOLOGUS (BYZANTINE EMPIRE) (*Micropædia*)

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BROADCASTING (*in part*)

D.G.Fa. **Daphne Gail Fautin.** *Adjunct Professor of Systematics and Ecology, University of Kansas, Lawrence. Coauthor of Field Guide to Anemonefishes and their Host Sea Anemones.*

CNIDARIANS (*in part*)

D.G.H. **David G. Haglund.** *Director, Centre for International Relations, Queen's University, Kingston, Ontario, Canada. Author of Alliance Within the Alliance?: Franco-German Military Cooperation and the European Pillar of Defense and others.*

NORTH ATLANTIC TREATY ORGANIZATION (*Micropædia*)

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1978–79. Sports reporter, Montreal Gazette, 1970–78.

SPORTS, MAJOR TEAM AND INDIVIDUAL (*in part*)

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COINS AND COINAGE (*in part*)

D.G.M. **David Grier Martin, Jr.** *Vice President for Public Affairs, University of North Carolina system, Chapel Hill.*

UNITED STATES OF AMERICA (*in part*)

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MALTHUS, THOMAS ROBERT (*Micropædia*)

D.Gr. **David Greene** (d. 1981). *Senior Professor, School of Celtic Studies, Dublin Institute for Advanced Studies. Author of The Irish Language.*

CELTIC LITERATURE (*in part*)

LANGUAGES OF THE WORLD (*in part*)

D.G.S. **David G. Sansing.** *Professor of History, University of Mississippi, University. Author of Mississippi: Its People and Culture and others.*

UNITED STATES OF AMERICA (*in part*)

D.G.Sa. **D. Gregory Sanford.** *Vermont State Archivist, Office of the Secretary of State, Montpelier. Editor of Vermont Municipalities: An Index to Their Charters and Special Acts.*

UNITED STATES OF AMERICA (*in part*)

D.G.Sc. **Dante G. Scarpelli, M.D.** *Ernest J. and Hattie H. Magerstadt Professor of Pathology, Northwestern University, Chicago.*

CANCER (*in part*)

DISEASE (*in part*)

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WEST INDIES, THE (*in part*)

D.H. **Derek Hopwood.** *Director, Middle East Centre, University of Oxford. Author of Egypt: Politics and Society, 1945–84.*

EGYPT (*in part*)

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UNITED STATES OF AMERICA (*in part*)

D.He. **David Herlihy** (d. 1991). *Henry C. Lea Professor of Medieval History, Harvard University, 1980–86. Mary Critchfield and Barnaby Keeney Professor of History, Brown University, Providence, Rhode Island, 1986–91. Author of Opera*

Muliebria: Women and Work in Medieval Europe.

EUROPEAN HISTORY AND CULTURE (*in part*)

D.H.E. **David H. Elliott.** *Professor of Occupational Health, Robens Institute of Industrial and Environmental Health and Safety, University of Surrey, England. Coauthor and coeditor of The Physiology and Medicine of Diving.*

RESPIRATION AND RESPIRATORY SYSTEMS (*in part*)

D.Hi. **Dorothy Hill.** *Research Professor Emeritus of Geology, University of Queensland, St. Lucia, Brisbane, Australia. Author of Paleozoic Corals; coauthor of Elements of the Stratigraphy of Queensland.*

OCEANS (*in part*)

D.H.J. **Douglas Henry Jones** (deceased). *Former Senior Lecturer in the History of West Africa, School of Oriental and African Studies, University of London.*

WESTERN AFRICA (*in part*)

D.H.P. **D.H. Pennington.** *Fellow and Tutor in History, Balliol College, Oxford, 1965–82; former Lecturer in Modern History, University of Oxford. Author of Seventeenth Century Europe.*

LAUD, WILLIAM (*in part*) (*Micropædia*)

D.H.R. **Donald H. Reiman.** *Adjunct Professor of English, University of Delaware, Newark. General Editor, The Bodleian Shelley Manuscripts. Editor of Shelley and His Circle (vol. 5–8); coeditor of The Complete Poetry of Percy Bysshe Shelley.*

SHELLEY, PERCY BYSSHE (*in part*) (*Micropædia*)

D.H.T. **David H. Tucker.** *Freelance researcher and writer. Author of The World Health Market and others.*

PUBLISHING (*in part*)

D.Hus. **Dyneley Hussey** (d. 1972). *Music Critic, The Times, London, 1923–46; The Listener, 1946–60. Author of Verdi; Some Composers of Opera.*

DONIZETTI, GAETANO (*Micropædia*)

VERDI, GIUSEPPE (*in part*) (*Micropædia*)

D.I. **David Irwin.** *Professor and Chairman, Department of History of Art, University of Aberdeen, Scotland. Author of English Neoclassical Art and others.*

CANOVA, ANTONIO, MARCHESE D'ISCHIA (*Micropædia*)

PAINTING, THE HISTORY OF WESTERN (*in part*)

SCULPTURE, THE HISTORY OF WESTERN (*in part*)

Di.B. **Dieter Brunnschweiler** (d. 1983). *Professor of Geography, Michigan State University, East Lansing. Coauthor of Geography in Latin America: Prospect for the Seventies.*

SOUTH AMERICA (*in part*)

Di.C. **Dieter Christensen.** *Professor of Music; Director, Center for Ethnomusicology, Columbia University. Author of Die Musik der Kate und Sialum; coauthor of Die Musik der Ellice-Inseln.*

OCEANIC ARTS (*in part*)

D.I.D. **Denis Ian Duveen.** *Consultant to the cosmetics industry in Brazil. President,*

Duveen Soap Corporation, Brooklyn, New York, 1949–69. Coauthor of A Bibliography of the Works of Antoine Laurent Lavoisier.

LAVOISIER

Di.L. **Diouldé Laya.** *Director, Centre for Linguistic and Historical Studies by Oral Tradition, Organization of African Unity, Niamey, Niger. Author of "Tradition orale et recherche historique en Afrique," Journal of World History (UNESCO).*

WESTERN AFRICA (in part)

D.Is. **Duane Isely.** *Professor of Botany, Iowa State University, Ames. Author of Leguminosae of the Southeastern United States and others.*

ANGIOSPERMS (in part)

D.J.A. de M. **Diana Julia Alexandra de Marly.** *Guest lecturer on the history of dress to museums, universities, and other institutions. Author of History of Haute Couture, 1850–1950 and others.*

DRESS AND ADORNMENT (in part)

D.J.Ba. **D. James Baker.** *Under Secretary for Oceans and Atmosphere, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Washington, D.C.*

EXPLORATION (in part)

D.J.Be. **David J. Bercuson.** *Professor of History, University of Calgary, Alberta; Dean, Faculty of Graduate Studies. Author of Maple Leaf Against the Axis: Canada's Second World War and others.*

CANADA (in part)

D.J.Br. **David J. Breeze.** *Chief Inspector of Ancient Monuments, Scotland. Author of The Northern Frontiers of Roman Britain; coauthor of Hadrian's Wall.*

HADRIAN'S WALL (Micropædia)

D.J.Bu. **David J. Buisseret.** *Director, Hermon Dunlap Smith Center for the History of Cartography, Newberry Library, Chicago. Professor of History, University of the West Indies, Kingston, Jamaica, 1964–80. Author of Port Royal, Jamaica and others.*

WEST INDIES, THE (in part)

D.J.F. **Douglas John Fosskett.** *Director of Central Library Services and Goldsmiths' Librarian, University of London, 1978–83. Author of Classification and Indexing in the Social Sciences and others.*

LIBRARIES (in part)

D.J.Fo. **David John Fox.** *Honorary Fellow in Geography, Victoria University of Manchester, England. Contributor to Latin America: Geographical Perspectives, 2nd ed.*

CENTRAL AMERICA (in part)

D.J.G. **Douglas James Guthrie, M.D. (d. 1975).** *Medical historian. Lecturer on the History of Medicine, University of Edinburgh, 1945–56. Author of A History of Medicine and others.*

MEDICINE (in part)

D.J.H. **Donald J. Hanahan.** *Professor of Biochemistry, University of Texas Health Science Center at San Antonio. Author of Lipide Chemistry.*

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D.J.M.H. **David J.M. Higgins (d. 1975).** *Associate Professor of English, Monmouth College, West Long Branch, New Jersey. Author of Portrait of Emily Dickinson.*

DICKINSON, EMILY (Micropædia)

D.J.R. **Donald J. Reish.** *Emeritus Professor of Biology, California State University, Long Beach. Author of Marine Life of Southern California.*

ANNELIDS

D.J.Ro. **David J. Robinson.** *Dellplain Professor of Latin American Geography, Syracuse University, New York. Editor of Studying Latin America.*

LIMA (in part)

D.J.S. **Dirk Jan Struik.** *Emeritus Professor of Mathematics, Massachusetts Institute of Technology, Cambridge. Author of Concise History of Mathematics and others.*

FOURIER, JOSEPH, BARON (Micropædia)

LAGRANGE, JOSEPH-LOUIS, COMTE DE L'EMPIRE (Micropædia)

LOBACHEVSKY, NIKOLAY IVANOVICH (Micropædia)

D.J.Sw. **Dennis J. Sweeney.** *Professor of Quantitative Analysis, University of Cincinnati, Ohio. Coauthor of Introduction to Statistics: Concepts and Applications and others.*

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D.J.W. **Donald John Wiseman.** *Emeritus Professor of Assyriology, School of Oriental and African Studies, University of London. Author of Chronicles of Chaldaean Kings.*

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D.J.Wa. **David John Watkin.** *Reader in the History of Architecture, University of Cambridge. Author of Thomas Hope 1769–1831 and the Neo-Classical Idea and others.*

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D.K. **Delmar Karlen (d. 1988).** *Professor of Law, New York University, New York City, 1953–77. Author of Judicial Administration: The American Experience and others.*

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D.K.B. **David K. Bandler.** *Professor of Food Science, Cornell University, Ithaca, New York. Coauthor of Milk Flavor and Quality: from Cow to Consumer.*

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D.Kg. **Donald King.** *Former Deputy Keeper, Victoria and Albert Museum, London.*

CRANACH, LUCAS, THE ELDER (in part) (Micropædia)

D.K.R. **David K. Rycroft.** *Former Senior Lecturer in Bantu Studies, School of Oriental and African Studies, University of London. Editor, Galpin Society Journal.*

Composer of national anthem of Swaziland. Author of Concise siSwati Dictionary.

AFRICAN ARTS (in part)

D.Ku. **Donald Kuspit.** *Professor of Art History and Philosophy, State University of New York, Stony Brook. Author of numerous articles, exhibition reviews, and catalog essays; contributing editor to Art Forum; Sculpture; and others.*

ART CRITICISM, HISTORY OF

D.L.D. **Decima L. Douie.** *Former Reader in Medieval History, University of Hull, England. Author of The Nature and the Effect of the Heresy of the Fraticelli and others.*

JOHN XXII (PAPACY) (Micropædia)

D.L.Di. **David L. Dilcher.** *Graduate Research Professor, Paleobotany Laboratory, Florida Museum of Natural History, University of Florida, Gainesville. Coauthor of Historical Perspectives of Angiosperm Evolution in Annals of the Missouri Botanical Garden (vol. 71).*

ANGIOSPERMS (in part)

D.Le. **Dominica Legge (d. 1986).** *Professor of Anglo-Norman Studies, University of Edinburgh, 1968–73. Author of Anglo-Norman Literature and Its Background and others.*

ANGLO-NORMAN LITERATURE (Micropædia)

D.Le V. **David Le Vay.** *Former Consultant Surgeon, National Health Service, United Kingdom. Author of Human Anatomy and Physiology.*

EXCRETION AND EXCRETORY SYSTEMS (in part)

D.L.F. **Denis Llewellyn Fox (d. 1983).** *Professor of Marine Biochemistry, Scripps Institution of Oceanography, University of California, San Diego, at La Jolla, 1948–69. Author of Animal Biochromes and Structural Colours.*

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D.L.G. **David L. Goodstein.** *Vice Provost and Professor of Physics and Applied Physics, California Institute of Technology, Pasadena. Coauthor of The Mechanical Universe and others.*

MECHANICS (in part)

D.L.Le. **David L. Lewis.** *Martin Luther King, Jr., University Professor of History, Rutgers University, New Brunswick, New Jersey. Author of King: A Critical Biography and others.*

KING, MARTIN LUTHER, JR. (in part) (Micropædia)

D.L.N. **David Lawrence Niddrie.** *Emeritus Professor of Geography, University of Florida, Gainesville. Author of Caribbean Geography and others.*

WEST INDIES, THE (in part)

D.L.P. **David Leo Pawson.** *Senior Research Scientist, National Museum of Natural History, Smithsonian Institution, Washington, D.C.; former Curator of Echinoderms.*

ECHINODERMS (in part)

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BUDDHISM, THE BUDDHA AND (*in part*)
CENTRAL ASIAN ARTS (*in part*)

D.L.Se. D.L. Serventy (d. 1988). *Principal Research Scientist, Division of Wildlife Research, Commonwealth Scientific and Industrial Research Organization, Nedlands, Australia; Officer in Charge, Western Australia Station, 1951–69. Researcher on the distribution and ecology of Australian birds. Author of Birds of Western Australia.*
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PORTUGAL (*in part*)

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JAMES I (GREAT BRITAIN) (*in part*)
(Micropædia)

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LANGUAGES OF THE WORLD (*in part*)

D.MacI. David MacIsaac. *Lieutenant Colonel, U.S. Air Force (retired). Professor of Military History, Air University, Maxwell Air Force Base, Alabama. Author of Strategic Bombing in World War II: The Story of the U.S. Strategic Bombing Survey.*
WAR, THE THEORY AND CONDUCT OF (*in part*)

D.M.Ar. Denis Midgley Arnold (d. 1986). *Heather Professor of Music, University of Oxford, 1975–86. Author of Monteverdi and others.*
MONTEVERDI, CLAUDIO (*in part*)
(Micropædia)

D.M.B. D. Mary Benson. *Writer. Author of Chief Albert Lutuli of South Africa and others.*
LUTULI, ALBERT (Micropædia)

D.M.Ba. David M. Bates. *Professor of Botany, Liberty Hyde Bailey Hortorium, Cornell University, Ithaca, New York. Contributor to Hortus Third.*
ANGIOSPERMS (*in part*)

D.M.Be. Dewey M. Beegle. *Emeritus Professor of Old Testament, Wesley Theological Seminary, Washington, D.C. Author of Moses, the Servant of Yahweh.*
MOSES (*in part*)

D.M.Bo. David Michael Bonavia (d. 1988). *Writer on China, Far Eastern*

Economic Review, Hong Kong. Foreign Correspondent, The Times (London). Author of The Chinese: A Portrait; Hong Kong 1997; and others.
PEKING (*in part*)

D.M.DeL. Dwight Moore DeLong (deceased). *Professor of Entomology, Ohio State University, Columbus. Coauthor of An Introduction to the Study of Insects.*
INSECTS (*in part*)

D.Mé. Daniel Ménager. *Professor of French Literature, University of Paris X. Author of Ronsard; le roi, le poète, et les hommes and others.*
FRENCH LITERATURE (*in part*)

D.M.Ea. David Magarey Earl. *Former Professor of History, Eastern Michigan University, Ypsilanti. Author of Emperor and Nation in Japan: Political Thinkers of the Tokugawa Period.*
SAIGŌ TAKAMORI (Micropædia)

D.M.G. David M. Gates. *Emeritus Professor of Biology, University of Michigan, Ann Arbor. Author of Energy Exchange in the Biosphere and others.*
BIOSPHERE AND CONCEPTS OF ECOLOGY, THE (*in part*)

D.M.Gi. Donald M. Ginsberg. *Professor of Physics, University of Illinois at Urbana-Champaign. Editor of Physical Properties of High Temperature Superconductors.*
MATTER (*in part*)

D.M.H. David M. Harland. *Space historian. Author of Jupiter Odyssey: The Story of NASA's Galileo Mission; Exploring the Moon: The Apollo Expeditions; and others.*
GALILEO (Micropædia)

D.M.Ha. David M. Hayne. *Emeritus Professor of French, University of Toronto. Coauthor of Bibliographie critique du roman canadien-français, 1837–1900.*
CANADIAN LITERATURE (*in part*)

D.Mi. Dorothy Middleton. *Assistant Editor, Geographical Journal, 1953–71. Author of Baker of the Nile and others.*
STANLEY, SIR HENRY MORTON (Micropædia)

D.M.J. Dorothy M. Johnson (d. 1984). *Freelance writer. Author of The Hanging Tree; A Man Called Horse; Montana.*
UNITED STATES OF AMERICA (*in part*)

D.M.K. David Marcus Knight. *Professor of History and Philosophy of Science, University of Durham, England. Author of Atoms and Elements and others.*
ARRHENIUS, SVANTE (Micropædia)

D.M.Ke. David M. Kunzle. *Professor of Art History, University of California, Los Angeles. Author of The History of the Comic Strip and others.*
CARICATURE, CARTOON, AND COMIC STRIP (*in part*)

D.M.L. David Malcolm Lewis (d. 1994). *Professor of Ancient History, University of Oxford, 1985–94. Author of Sparta and Persia; joint editor of Cambridge Ancient History (2nd ed., vol. 4–5).*
PERICLES (Micropædia)

D.M.La. David Marshall Lang (d. 1991). *Professor of Caucasian Studies, University*

of London, 1964–84. Author of A Modern History of Georgia; The Georgians; and others.
TRANSCAUCASIA (*in part*)

D.M.L.-J. David Mathias Lloyd-Jones. *Musicologist and conductor; specialist in Slavic music. Founder and Artistic Director, Opera North, Leeds, England, 1978–90.*
DVOŘÁK, ANTONÍN (Micropædia)

D.M.Lo. David Morrice Low (d. 1972). *Classical Lecturer and Subdean, Arts Faculty, King's College, University of London, 1945–57. Author of Edward Gibbon, 1737–94 and others.*
GIBBON, EDWARD (Micropædia)

D.M.N. Donald MacGillivray Nicol. *Koraës Professor Emeritus of Byzantine and Modern Greek History, Language, and Literature, King's College, University of London. Director, Gennadius Library, American School of Classical Studies at Athens, 1989–92. Author of The Last Centuries of Byzantium and others.*
BYZANTINE EMPIRE, THE HISTORY OF THE (*in part*)
CONSTANTINE THE GREAT (*in part*)

D.M.Ne. David M. Nelson (d. 1991). *Dean, College of Physical Education, Athletics and Recreation, University of Delaware, Newark. Former football coach. Author of Football: Principles and Play.*
SPORTS, MAJOR TEAM AND INDIVIDUAL (*in part*)

D.Mo. David Morens. *Medical Epidemiologist, National Institute of Allergy and Infectious Diseases, National Institutes of Health, Bethesda, Maryland. Professor of Epidemiology and Tropical Medicine, University of Hawaii School of Medicine, Honolulu.*
FIBROMYALGIA (Micropædia)
GULF WAR SYNDROME (Micropædia)
WEST NILE VIRUS (Micropædia)

D.M.P. Dorothy M. Pickles (d. 1994). *Writer, lecturer, and broadcaster. Author of The Fifth French Republic and others.*
GAULLE, CHARLES DE (*in part*) (Micropædia)

D.M.Po. Duncan M. Porter. *Professor of Botany, Virginia Polytechnic Institute and State University, Blacksburg. Author of Rare and Endangered Vascular Plant Species in Virginia and others.*
ANGIOSPERMS (*in part*)

D.M.S. D.M. Sen. *Vice-Chancellor, University of Burdwan, West Bengal, India, 1965–69.*
INDIA (*in part*)

D.M.W. David M. Warshaw. *Professor of Molecular Physiology and Biophysics, University of Vermont, Burlington.*
MUSCLES AND MUSCLE SYSTEMS (*in part*)

D.M.Wh. D. Maxwell White. *Emeritus Professor of Italian Language and Literature, University of Leeds, England. Author of Zaccaria Seriman and others.*
ITALIAN LITERATURE (*in part*)

D.N. Dika Newlin. *Composer. Professor of Music, Virginia Commonwealth University, Richmond. Author of Bruckner-Mahler-Schoenberg; Schoenberg Remembered.*

SCHOENBERG, ARNOLD (in part) .
(Micropædia)

D.Ne. Douglas Newton. Evelyn A.J. Hall and John A. Friede Chairman, Department of Primitive Art, Metropolitan Museum of Art, New York City. Author of Masterpieces of Primitive Art: The Nelson A. Rockefeller Collection and others.
OCEANIC ARTS (in part)

D.N.J. D.N. Jeans. Associate Professor of Geography, University of Sydney. Author of The Open Air Museum: The Cultural Landscape of New South Wales; editor of Australia: A Geography (2 vol.).
AUSTRALIA (in part)

D.N.K. David N. Keightley. Professor of History, University of California, Berkeley. Author of Sources of Shang History: The Oracle-Bone Inscriptions of Bronze Age China.
CHINA (in part)

D.N.McM. David N. McMaster. Former Reader in Geography, University of Edinburgh. Coauthor of An Advanced Geography of Africa.
AFRICA (in part)

D.N.P. Devavrat Nanubhai Pathak. Former Vice-Chancellor, Saurashtra University, Rajkot, India. Coauthor of Three General Elections in Gujarat.
INDIA (in part)

D.N.W. Donald N. Wilber. Freelance writer and consultant on the Middle East and Southeast Asia. Author of Iran Past and Present and others.
SHĀPŪR II (PERSIA) (Micropædia)

D.O. David Oteiza. Professor of Geography of the Western Hemisphere, National University of La Plata, Argentina. Author of Geografía regional de Eurasia y Africa.
SOUTH AMERICA (in part)

Do.A.H. Donald Albert Heath (d. 1997). George Holt Professor of Pathology, University of Liverpool, England. Coauthor of The Human Pulmonary Circulation.
RESPIRATION AND RESPIRATORY SYSTEMS (in part)

D.O.B. Donald O. Bushman (d. 1973). Associate Professor of Geography, University of South Carolina, Columbia, 1960–73.
UNITED STATES OF AMERICA (in part)

D.O.D.W. David O.D. Wurfel. Professor of Political Science, University of Windsor, Ontario. Author of Filipino Politics: Development and Decay.
PHILIPPINES (in part)

D.O.E. Dietz O. Edzard. Professor of Assyriology, Ludwig Maximilian University of Munich. Author of Die zweite Zwischenzeit Babyloniens.
MESOPOTAMIA, THE HISTORY OF ANCIENT (in part)

D.Ol. Daria Olivier. Writer, translator, book reviewer, and historian. Author of Alexandre I^{er} and others.
ALEXANDER I (RUSSIA) (Micropædia)

D.O.L. Deryck O. Lodrick. Research Associate, Center for South Asia Studies, University of California, Berkeley. Author

of Sacred Cows, Sacred Places: Origins and Survival of Animal Homes in India; coeditor of The Idea of Rajasthan: Explorations in Regional Identity.
ASIA (in part)
INDIA (in part)

D.O.N. David O. Norris. Professor of Biology, University of Colorado, Boulder. Author of Vertebrate Endocrinology.
ENDOCRINE SYSTEMS (in part)

Do.S. Donald Southgate. Former Reader in Political and Constitutional History, University of Dundee, Scotland. Author of The Most English Minister—The Policies and Politics of Palmerston.

PALMERSTON, HENRY JOHN TEMPLE, 3RD VISCOUNT (in part) (Micropædia)

D.O.S. David O. Siegmund. Professor of Statistics, Stanford University, California. Author of Sequential Analysis.
PROBABILITY THEORY

D.P. Dimitris Pournaras. Former Publisher and Editor of Eleutheros (newspaper), Athens. Former Chairman, Greek Broadcasting Corporation. Author of Eleuthérios Venizélos and others.
VENIZÉLOS, ELEUTHÉRIOS (Micropædia)

D.P.B. David P. Billington. Professor of Civil Engineering, Princeton University. Author of The Tower and the Bridge: the New Art of Structural Engineering and many others.
PUBLIC WORKS (in part)

D.P.Ch. David P. Chandler. Professor of History, Monash University, Clayton, Australia. Author of The Tragedy of Cambodian History and others.
SOUTHEAST ASIA (in part)

D.P.Cl. Derek Plint Clifford. Freelance writer. Author of A History of Garden Design and others.
GARDEN AND LANDSCAPE DESIGN (in part)

D.P.Ga. David P. Gamble. Emeritus Professor of Anthropology, San Francisco State University. Author of The Wolof of Senegambia.
WESTERN AFRICA (in part)

D.Pi. Dag Pike. Marine surveyor and consultant. Author of Fishing Boats and Their Equipment; Powerboats in Rough Seas; and others.
FISHING, COMMERCIAL (in part)

D.P.K. Diane P. Koenker. Professor of History, University of Illinois at Urbana-Champaign. Author of Labor Relations in Socialist Russia: Printers, Their Unions, and the Origins of Soviet Socialism, 1918–1921 and others.
WORK AND EMPLOYMENT (in part)

D.Pl. Dijana Pleština. Associate Professor and Chair, Department of Political Science, College of Wooster, Ohio. Author of Regional Development in Communist Yugoslavia and others.
BALKAN STATES (in part)

D.P.L. Donald P. Little. Professor, Institute of Islamic Studies, McGill University, Montreal. Author of An Introduction to Mamlūk Historiography.
EGYPT (in part)
MU'AWIYAH I (Micropædia)

D.P.M.C. Dominique P.M. Collon. Curator, Department of Western Asiatic Antiquities, British Museum, London. Author of First Impressions: Cylinder Seals in the Ancient Near East; Near Eastern Seals.

TURKEY AND ANCIENT ANATOLIA (in part)

D.P.O'C. Daniel Patrick O'Connell (d. 1979). Chichele Professor of International Law, University of Oxford, 1972–79. Author of Richelieu and others.

RICHELIEU, ARMAND-JEAN DU PLESSIS, CARDINAL ET DUC DE (in part)
(Micropædia)

D.P.T. David P. Thelen. Professor of History, Indiana University, Bloomington. Author of Robert M. La Follette and the Insurgent Spirit.

LA FOLLETTE, ROBERT M. (in part)
(Micropædia)

D.Q.A. Douglas Q. Adams. Professor of English, University of Idaho, Moscow. Author of Tocharian Historical Phonology and Morphology.

LANGUAGES OF THE WORLD (in part)

D.R. Don Russell (d. 1986). Freelance writer. Author of The Wild West: A History of the Wild West Shows.
RODEO (Micropædia)

D.Ra. David Rayside. Professor of Political Science, University College, University of Toronto. Author of On the Fringe: Gays and Lesbians in Politics; A Small Town in Modern Times: Alexandria.

CANADIAN ALLIANCE (Micropædia)
LIBERAL PARTY OF CANADA (Micropædia)

D.R.A. David R. Anderson. Professor of Quantitative Analysis, University of Cincinnati, Ohio. Coauthor of Introduction to Statistics: Concepts and Applications and others.
STATISTICS (in part)

D.R.C. David R. Coffin. Howard Crosby Butler Memorial Professor Emeritus of the History of Architecture, Princeton University. Author of Villa d'Este at Tivoli and others.

ARCHITECTURE, THE HISTORY OF WESTERN (in part)

D.R.D. Donald Reynolds Dudley (d. 1972). Professor of Latin, University of Birmingham, England, 1955–72. Author of The Romans.
SENECA, LUCIUS ANNAEUS (Micropædia)

D.Re. Donald Read. Professor of Modern English History, University of Kent at Canterbury, England. Author of Cobden and Bright and others.
BRIGHT, JOHN (Micropædia)

D.R.G. Denis Rolleston Gwynn (d. 1971). Research Professor of Modern Irish History, University College, Cork, National University of Ireland, 1946–63. Author of The History of Partition.
DE VALERA, EAMON (Micropædia)

D.R.Ha. David Russell Harris. Professor of Human Environment, Institute of Archaeology, University of London.
WEST INDIES, THE (in part)

D.R.K. **David R. Klein.** *Professor of Biology and Wildlife; Senior Scientist, Alaska Cooperative Fish and Wildlife Research Unit, University of Alaska, Fairbanks. Author of A Study of the Range Interrelationships of the Western Arctic Caribou Herd and many others.*

BIOSPHERE AND CONCEPTS OF ECOLOGY, THE (in part)

D.R.M. **Donald R. Morris.** *Publisher, Donald R. Morris Newsletter, Houston, Texas. Author of The Washing of the Spears: A History of the Rise of the Zulu Nation Under Shaka and Its Fall in the Zulu War of 1879.*

SHAKA (Micropædia)

D.Ro. **Dov Ronen.** *Affiliate, Center for International Affairs, Harvard University. Author of Dahomey: Between Tradition and Modernity.*

WESTERN AFRICA (in part)

D.R.O. **David R. Olson.** *Professor of Applied Psychology, Ontario Institute for Studies in Education, Toronto. Author of The World on Paper: The Conceptual and Cognitive Implications of Writing and Reading.*

WRITING (in part)

D.R.P. **Donald Rahl Petterson** (d. 1966). *Professor of Geography, East Carolina College, Greenville, North Carolina.*

WESTERN AFRICA (in part)

D.R.S. **David Roger Smith.** *Project Manager, Monitoring CIS Environmental Developments, Monterey Institute of International Studies, California.*

CENTRAL ASIA (in part)

D.R.Sh. **Donald Raymond Shuster.** *Associate Professor of Education, University of Guam, Mangilao. Author of articles on Palau.*

PACIFIC ISLANDS (in part)

D.S.H.W.N. **Davidson S.H.W. Nicol** (d. 1994). *Associate Lecturer, Centre of International Studies, University of Cambridge, 1985–94. Undersecretary-General, United Nations, and Executive Director, United Nations Institute for Training and Research, New York City, 1972–82. Ambassador for Sierra Leone to the United Nations, 1969–71. Editor of Paths to Peace and others.*

AFRICA (in part)

WESTERN AFRICA (in part)

D.Si. **Denis Sinor.** *Distinguished Professor Emeritus of Uralic and Altaic Studies and of History, Indiana University, Bloomington. Author of Inner Asia; History of Hungary; and others.*

CENTRAL ASIA (in part)

HUNGARIAN LITERATURE (in part)

D.S.J. **David Starr Jordan, M.D.** (d. 1931). *Chancellor, Stanford University, California, 1913–16; President, 1891–1913. President, Indiana University, Bloomington, 1885–91; Professor of Zoology, 1879–85. Author of A Guide to the Study of Fishes.*

AGASSIZ, LOUIS (Micropædia)

D.S.K. **Diane S. Kukich.** *Technical Writer and Editor, Center for Composite Materials, University of Delaware, Newark.*

Editor of Spring 1989 CCM Research Reviews.

MATERIALS SCIENCE (in part)

D.S.L. **Donald S. Lopez.** *Carl W. Belser Professor of Buddhist and Tibetan Studies, University of Michigan, Ann Arbor. Author of The Story of Buddhism and Prisoner of Shangri-La: Tibetan Buddhism and the West. Editor of numerous Buddhist texts.*

BUDDHA (in part)

D.So. **Dominique Sourdel.** *Professor of Muslim Civilization, University of Paris IV. Author of Le Vizirat 'abbâsîde de 749 à 936 and others.*

MA'MŪN, AL- (Micropædia)

D.Sp. **David Spring.** *Professor of History, Johns Hopkins University, Baltimore. Author of The English Landed Estate in the Nineteenth Century.*

RUSSELL, JOHN RUSSELL, 1ST EARL (Micropædia)

D.S.R. **Daniel Sommer Robinson** (d. 1977). *Professor and Director, School of Philosophy, University of Southern California, Los Angeles, 1946–54. Author of Royce and Hocking: American Idealists and others.*

PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (in part)

D.S.Ri. **D.S. Richards.** *Lecturer in Arabic, University of Oxford. Coauthor of Mamluk Jerusalem: An Architectural Study.*

EGYPT (in part)

D.S.Ru. **Dean S. Rugg.** *Emeritus Professor of Geography, University of Nebraska, Lincoln. Author of Eastern Europe and others.*

BALKAN STATES (in part)

D.S.T. **Derick S. Thomson.** *Emeritus Professor of Celtic, University of Glasgow. Author of The Companion to Gaelic Scotland and others.*

CELTIC LITERATURE (in part)

D.Su. **Denys Sutton** (d. 1991). *Editor, Apollo magazine, 1962–87. Art Critic, Financial Times. Author of Bonnard; Nocturne: The Art of James McNeill Whistler; and others.*

BONNARD, PIERRE (Micropædia)

WHISTLER, JAMES MCNEILL (in part) (Micropædia)

D.T. **David Turnock.** *Reader in Geography, University of Leicester, England. Author of An Economic Geography of Romania and others.*

BALKAN STATES (in part)

D.Ta. **Daina Taimina.** *Professor of Mathematics at Cornell University, Ithaca, New York. Author of History of Mathematics; Mathematics Fun; with David Henderson, Differential Geometry; Experiencing Geometry in Euclidean, Spherical, and Hyperbolic Spaces.*

GEOMETRY (in part)

D.T.E. **Dudley Tate Easby, Jr.** (d. 1973). *Secretary, Metropolitan Museum of Art, New York City, 1945–69; Chairman, Department of Primitive Art, 1969–71.*

DECORATIVE ARTS AND FURNISHINGS (in part)

D.T.F. **Daniel T. Finkbeiner II** (d. 1986). *Professor of Mathematics, Kenyon College, Gambier, Ohio, 1956–84. Author of Matrices and Linear Transformations. ANALYSIS (IN MATHEMATICS) (in part)*

D.t.H. **Dirk ter Haar.** *Emeritus Reader in Theoretical Physics, University of Oxford; Emeritus Fellow of Magdalen College, Oxford. Author of Elements of Statistical Mechanics.*

LANDAU, LEV DAVIDOVICH (Micropædia)

D.T.J. **The Rev. Daniel T. Jenkins.** *Weyerhaeuser Professor of Systematic Theology, Princeton Theological Seminary, New Jersey, 1981–84. Author of Christian Maturity and Christian Success and others. PROTESTANTISM (in part)*

D.T.McL. **David T. McLellan.** *Professor of Political Theory, University of Kent at Canterbury, England. Author of Marxism after Marx and others.*

MARXISM, MARX AND (in part)

D.T.R. **David Talbot Rice** (d. 1972). *Watson-Gordon Professor of the History of Fine Art, University of Edinburgh, 1934–72; Vice-Principal, 1968–71. Author of Byzantine Art and others.*

ARCHITECTURE, THE HISTORY OF WESTERN (in part)

PAINTING, THE HISTORY OF WESTERN (in part)

SCULPTURE, THE HISTORY OF WESTERN (in part)

D.V. **Dora Vallier.** *Art critic. Author of Henri Rousseau: Catalogue raisonné de l'oeuvre; Henri Rousseau; and others.*

ROUSSEAU, HENRI (Micropædia)

D.V.B. **David V. Bates, M.D.** *Emeritus Professor of Medicine, University of British Columbia, Vancouver. Coauthor of Respiratory Function in Disease.*

RESPIRATION AND RESPIRATORY SYSTEMS (in part)

D.V.Cn. **Denis Victor Cowen.** *Former Professor of Law, University of Chicago. Former Professor of Comparative Law, University of Cape Town.*

LEGAL SYSTEMS, THE EVOLUTION OF MODERN WESTERN (in part)

D.V.Co. **Deryck V. Cooke** (d. 1976). *Musicologist. Music Presentation Editor, British Broadcasting Corporation, London, 1965–76. Author of Mahler, 1860–1911. Completed Mahler's unfinished 10th Symphony.*

MAHLER, GUSTAV (Micropædia)

WAGNER, RICHARD (in part) (Micropædia)

D.W. **Dorothy Whitelock** (d. 1982). *Elington and Bosworth Professor of Anglo-Saxon, University of Cambridge, 1957–69. A leading authority on Anglo-Saxon England. Author of Beginnings of English Society; editor of English Historical Documents c. 500–1042.*

ALFRED (Micropædia)

CANUTE (Micropædia)

UNITED KINGDOM (in part)

D.Wa. **David Waines.** *Senior Lecturer in Islamic Studies, University of Lancaster, England. Author of An Introduction to Islam.*

TABARI, AT- (Micropædia)

D.W.C. David W. Crabb. *Emeritus Professor of Anthropology, Princeton University. Author of Ekoid Bantu Languages of Ogaja (Eastern Nigeria).*
LANGUAGES OF THE WORLD (in part)

D.We. Donald Weinstein. *Emeritus Professor of History, University of Arizona, Tucson. Author of Savonarola and Florence; Ambassador from Venice.*
EUROPEAN HISTORY AND CULTURE (in part)

D.W.F. Don W. Fawcett, M.D. *Professor Emeritus of Anatomy, Harvard Medical School, Harvard University. Coauthor of Textbook of Histology.*

SUPPORTIVE AND CONNECTIVE TISSUES (in part)

D.W.Fi. Donald W. Fiske. *Emeritus Professor of Psychology, University of Chicago. Author of Measuring the Concepts of Personality and others.*

PSYCHOLOGICAL TESTS AND MEASUREMENT (in part)

D.W.Ga. Daniel W. Gade. *Professor of Geography, University of Vermont, Burlington. Author of Plants, Man and the Land in the Vilcanota Valley of Peru.*
SOUTH AMERICA (in part)

D.W.H. David W. Henderson. *Professor of Mathematics, Cornell University, Ithaca, New York. Author of Differential Geometry: A Geometric Introduction; Experiencing Geometry in Euclidean, Spherical, and Hyperbolic Spaces.*
GEOMETRY (in part)

D.W.I. Donald W. Insall. *Principal Architect, Donald W. Insall and Associates (architects and planning consultants), London. Founding Commissioner, the Historic Buildings and Monuments Commission for England. Author of The Care of Old Buildings Today and others.*
ARTS, PRACTICE AND PROFESSION OF THE (in part)

D.W.K. Daniel Wilhelmus Kruger. *Former Professor of History, University of the Transkei, Umtata. Author of Paul Kruger.*
KRUGER, PAUL (Micropædia)

D.W.K.-J. Douglas W. Kent-Jones (d. 1978). *President, British Industrial Biological Research Association, Carshalton, England. Coauthor of Modern Cereal Chemistry.*
FARMING AND AGRICULTURAL TECHNOLOGY (in part)
FOOD PROCESSING (in part)
NUTRITION (in part)

D.W.L. Donald William Lucas (d. 1985). *P.M. Lawrence Reader in Classics, University of Cambridge, 1952–69. Author of The Greek Tragic Poets; A Commentary on Aristotle's Poetics.*
GREEK LITERATURE (in part)

D.W.M. D.W. Maurer (d. 1981). *Professor of Linguistics, University of Louisville, Kentucky. Author of Whiz-Mob: A Correlation of the Argot of Professional Pick-Pockets with Their Behavior Patterns and numerous articles and papers on slang.*
LANGUAGE (in part)

D.Wo. Douglas Woodruff (d. 1978). *Editor, The Tablet, London, 1936–67. Author of Church and State in History.*
PIUS V, SAINT (in part) (Micropædia)
PIUS IX (in part) (Micropædia)

D.W.O'C. Daniel William O'Connor. *Charles A. Dana Professor Emeritus of Religious Studies and of Classical Languages, Saint Lawrence University, Canton, New York. Author of Peter in Rome: The Literary, Liturgical and Archeological Evidence.*
PETER THE APOSTLE, SAINT (in part) (Micropædia)

D.W.S. Denis William Stevens. *President, Academia Monteverdiana. Professor of Musicology, Columbia University, 1964–76. Author of Tudor Church Music and others.*
MUSICAL FORMS AND GENRES (in part)
PALESTRINA, GIOVANNI PIERLUIGI DA (Micropædia)

D.W.S.H. Sir David Wathen Stather Hunt. *High Commissioner for the U.K. in Cyprus, 1965–67; Ambassador to Brazil, 1969–73. Coauthor and editor of Footprints in Cyprus.*
CYPRUS (in part)

D.W.St. Dennis William Stevenson. *Director, Harding Laboratory, New York Botanical Garden, Bronx; Editor, Botanical Review. Editor of The Biology, Structure, and Systematics of the Cycadales.*
ANGIOSPERMS (in part)

D.Y. Doreen Yarwood. *Freelance writer and lecturer in art and architecture. Author of Fashion in the Western World and others.*
DRESS AND ADORNMENT (in part)

E.A. Eric Axelson. *Emeritus Professor of History, University of Cape Town, former Assistant Principal. Author of Congo to Cape: Early Portuguese Explorers and others.*
CAPE TOWN (in part)

E.A.B. Ernest Amano Boateng. *Environmental and educational consultant. Executive Chairman, Environmental Protection Council of Ghana, Accra, 1973–81. Vice-Chancellor, University of Cape Coast, Ghana, 1971–73. Author of A Geography of Ghana and others.*
WESTERN AFRICA (in part)

E.A.Bo. Edmund Addison Bowles. *Instructor in the Humanities, Massachusetts Institute of Technology, Cambridge, 1951–55. Vice President, American Musical Instrument Society, 1984–88. Author of The Timpani: A History in Pictures and Documents and others.*
MUSICAL INSTRUMENTS (in part)

E.A.D. Eugene A. Davidson. *Professor and Chairman, Department of Biochemistry and Molecular Biology, Georgetown University, Washington, D.C. Author of Carbohydrate Chemistry.*
BIOCHEMICAL COMPONENTS OF ORGANISMS (in part)

E.A.Ha. Eric Alfred Havelock (d. 1988). *Sterling Professor of Classics, Yale*

University, 1963–71. Author of The Lyric Genius of Catullus and others.

CATULLUS, GAIUS VALERIUS (Micropædia)
E.A.J.D. Ernest Albert John Davies (d. 1991). *Publisher, Traffic Engineering and Control; Editor, 1960–76. Member of Parliament, 1945–59. Chairman, Labour Party Transport Committee, 1945–59. Author of Traffic Engineering Practice.*
PUBLIC WORKS (in part)
TRANSPORTATION (in part)

E.A.K. E.A. Kracke, Jr. (d. 1976). *Professor of Chinese Literature and Institutions, University of Chicago, 1960–73. Author of Civil Service in Early Sung China, 960–1067.*
T'AI TSU (SUNG DYNASTY) (Micropædia)

Ea.L. Earl Latham (d. 1977). *Joseph B. Eastman Professor of Political Science, Amherst College, Massachusetts, 1948–73. Author of The Group Basis of Politics and others.*
SOCIAL SCIENCES, THE (in part)

E.Al. Edward Allworth. *Emeritus Professor of Turco-Soviet Studies, Columbia University. Author of Soviet Asia; The Modern Uzbeks; and others.*
CENTRAL ASIA (in part)
TRANSCAUCASIA (in part)

E.A.M. Edward A. Mason (d. 1994). *Professor of Chemistry and Engineering, 1967–92; Newport Rogers Professor of Chemistry, 1983–92, Brown University, Providence, Rhode Island. Coauthor of Transport Properties of Ions in Gases and others.*
MATTER (in part)

E.A.O. Edwin A. Olson. *Emeritus Professor of Geology, Whitworth College, Spokane, Washington. Coeditor of Proceedings of the Sixth International Conference on Radiocarbon and Tritium Dating.*
GEOCHRONOLOGY (in part)

E.A.P. Edwin A. Peel (d. 1992). *Professor of Education, University of Birmingham, England, 1950–78. Editor, Educational Review. Author of The Psychological Basis of Education.*
TEACHING (in part)

E.Ar. Endel Aruja. *Author of Estonian Books and Periodicals.*
BALTIC STATES (in part)

E.A.R. The Rev. Edward A. Ryan, S.J. (d. 1964). *Rector, Our Lady of Martyrs Tertiarity, Auriesville, New York, 1962–64. Professor of Church History, Woodstock College, Maryland, 1936–62.*
LOYOLA, SAINT IGNATIUS OF (in part) (Micropædia)

E.A.R.B. Elizabeth A.R. Brown. *Emerita Professor of History, Brooklyn College and the Graduate Center, City University of New York.*
PHILIP IV (FRANCE) (Micropædia)

E.As. Eliot Asinof. *Author of Eight Men Out: The Black Sox and the 1919 World Series and others.*
SHOELESS JOE JACKSON (Micropædia)

- E.A.T. E.A. Thompson** (d. 1994). *Professor of Classics, University of Nottingham, England, 1948–79. Author of The Early Germans; A History of Attila and the Huns; and others.*
ATTILA (Micropædia)
STILICHO, FLAVIUS (Micropædia)
THEODORIC (ITALY) (Micropædia)
- E.A.Ty. Elizabeth A. Treacy.** *Technical editor for the Oracle Corporation.*
HITACHI, LTD. (Micropædia)
NEC CORPORATION (Micropædia)
- E.A.U. E. Ashworth Underwood, M.D.** (d. 1980). *Director, Wellcome Institute of the History of Medicine, London, 1946–64. Editor of Science, Medicine and History.*
HIPPOCRATES (Micropædia)
MEDICINE (in part)
NIGHTINGALE, FLORENCE (Micropædia)
REED, WALTER (Micropædia)
VIRCHOW, RUDOLF (Micropædia)
- E.A.W. Edwin A. Winckler.** *Research Associate, East Asian Institute, Columbia University. Coeditor of Contending Approaches to the Political Economy of Taiwan.*
TAIWAN (in part)
- E.A.W.G. Elizabeth Ann Wynne Gunner.** *Lecturer in African Literature, School of Oriental and African Studies, University of London. Author of A Handbook for Teaching African Literature.*
AFRICAN ARTS (in part)
- E.B. Edward Bridges, 1st Baron Bridges** (d. 1969). *Privy Councillor. Permanent Secretary to H.M. Treasury, London, 1945–56. Author of Portrait of a Profession.*
PUBLIC ADMINISTRATION (in part)
- E.Ba. E. Badian.** *John Moors Cabot Professor of History, Harvard University. Author of Roman Imperialism in the Late Republic and others.*
GREEK AND ROMAN CIVILIZATIONS, ANCIENT (in part)
- E.B.B. E. Bradford Burns** (d. 1995). *Professor of History, University of California, Los Angeles. Author of A History of Brazil and others.*
BRAZIL (in part)
- E.B.D. Edward Bronson Diethrich, M.D.** *Director; Chief of Cardiovascular Surgery, Arizona Heart Institute, Phoenix.*
CIRCULATION AND CIRCULATORY SYSTEMS (in part)
- E.Be. Edward Kamau Brathwaite.** *Poet and critic. Professor of History, University of the West Indies, Mona (Kingston), Jamaica. Author of Rights of Passage; The Development of Creole Society in Jamaica.*
CARIBBEAN LITERATURE (Micropædia)
- E.B.E. Edward B. Evenson.** *Professor of Geological Sciences, Lehigh University, Bethlehem, Pennsylvania. Coeditor of Tills and Related Deposits.*
CONTINENTAL LANDFORMS (in part)
- E.B.Fr. Edmund B. Fryde.** *Emeritus Professor of History, University College of Wales, Aberystwyth, University of Wales. Coeditor of Handbook of British Chronology.*
HISTORY, THE STUDY OF (in part)
- E.B.G. Elizabeth Belmont Gasking** (d. 1973). *Senior Lecturer in the History and Philosophy of Science, University of Melbourne, Australia. Author of Investigations into Generation, 1651–1828.*
SPALLANZANI, LAZZARO (Micropædia)
- E.B.H. Earl B. Hunt.** *Professor of Psychology, University of Washington, Seattle. Author of Concept Learning.*
LEARNING AND COGNITION, HUMAN (in part)
- E.Bi. Elez Biberaj.** *Chief, Albanian Service, Voice of America, United States Information Agency, Washington, D.C. Author of Albania: A Socialist Maverick.*
BALKAN STATES (in part)
- E.Bl. Eric Block.** *Professor of Chemistry, State University of New York at Albany. Author of Reactions of Organosulfur Compounds and others.*
CHEMICAL COMPOUNDS (in part)
- Eb.R. Eberhard Ruhmer.** *Former Curator in Chief, Bavarian State Painting Collection, Munich. Author of Cosimo Tura; Grünewald; and others.*
DÜRER, ALBRECHT (in part) (Micropædia)
- E.Br. Ernle Bradford** (d. 1986). *Author of The Wind Commands Me: A Life of Sir Francis Drake and others.*
DRAKE, SIR FRANCIS (Micropædia)
- E.B.R. Elwyn B. Robinson** (d. 1985). *University Professor of History, University of North Dakota, Grand Forks, 1951–70. Author of History of North Dakota.*
NORTH AMERICA (in part)
UNITED STATES OF AMERICA (in part)
- E.B.Wo. Everett B. Woodruff.** *Former Project Engineer, A.M. Kinney, Inc., Cincinnati, Ohio. Coauthor of Steam-Plant Operation.*
ENERGY CONVERSION (in part)
- E.Ca. Enzo Carli.** *Director, Cathedral Museum, Siena, Italy. Author of Duccio.*
DUCCIO DI BUONINSEGNA (Micropædia)
- E.C.B. Elinor C. Burkett.** *Writer and historian. Author of The Right Women: A Journey Through the Heart of Conservative America and others.*
FEMINISM
WOMEN'S MOVEMENT (Micropædia)
- E.C.D. Edward C. Dimock, Jr.** *Professor of Bengali and Bengal Studies, University of Chicago. Author of The Place of the Hidden Moon.*
HINDUISM (in part)
SOUTH ASIAN ARTS (in part)
- E.C.E. Edward C. Ezell** (d. 1993). *Curator, Armed Forces History, 1982–93; Acting Chair, History of Science and Technology, 1991–93, National Museum of American History, Smithsonian Institution, Washington, D.C. Author of Small Arms Today and others; editor of Small Arms of the World.*
WAR, THE TECHNOLOGY OF (in part)
- E.C.G. Ernst C. Griffin.** *Professor of Geography, San Diego State University, California.*
MEXICO (in part)
SOUTH AMERICA (in part)
- E.C.H. Edgar Crawshaw Holt** (d. 1975). *Author and journalist. Author of The Making of Italy, 1815–1870.*
MAZZINI, GIUSEPPE (Micropædia)
- E.Cl. Eugene Clark.** *Emeritus Professor of Economics, Washington State University, Pullman; Dean, College of Economics and Business, 1957–77.*
UNITED STATES OF AMERICA (in part)
- E.C.LaF. Eugene C. LaFond.** *General Manager, LaFond Oceanic Consultants, San Diego, California. Member, Commission for Developing Countries, International Association for the Physical Sciences of the Ocean. Author of Processing Oceanographic Data.*
PACIFIC OCEAN, THE (in part)
- E.C.N. E. Clifford Nelson.** *Emeritus Professor of Religion, St. Olaf College, Northfield, Minnesota. Author of The Rise of World Lutheranism and others.*
PROTESTANTISM (in part)
- E.C.O. Everett C. Olson** (d. 1993). *Professor of Zoology, University of California, Los Angeles, 1969–78. Editor, Evolution, 1952–58.*
ROMER, ALFRED SHERWOOD (Micropædia)
- E.C.P. Edward C. Page.** *Reader in Political Science, University of Hull, England. Author of Political Authority and Bureaucratic Power.*
PUBLIC ADMINISTRATION (in part)
- E.C.Po. Edgar Charles Polomé.** *Christie and Stanley E. Adams, Jr., Centennial Professor of Liberal Arts, University of Texas at Austin. Editor of The Indo-Europeans, Fourth and Third Millennia and others.*
EUROPEAN RELIGIONS, ANCIENT (in part)
- E.C.R. Edward C. Riley.** *Emeritus Professor of Hispanic Studies, University of Edinburgh. Author of Cervantes's Theory of the Novel and others.*
CERVANTES
- E.C.W. E. C. Wallenfeldt.** *Emeritus Professor, Kent (Ohio) State University. Author of The Six-Minute Fraternity: The Rise and Fall of NCAA Tournament Boxing, 1932–60.*
BOXING (in part)
- Ed. The Editors.**
- E.D.D. Ethel Deikman Dunn.** *Executive Secretary, Highgate Road Social Science Research Station, Inc., Berkeley, California. Coauthor of The Peasants of Central Russia.*
ASIAN PEOPLES AND CULTURES (in part)
- Ed.G. Edwin Gerow.** *Professor of Religion and Humanities, Reed College, Portland, Oregon. Author of Indian Poetics; coauthor of Theatre of Memory: The Plays of Kālidāsa.*
KĀLIDĀSA (in part) (Micropædia)
- E.D.H. Earl Dorchester Hanson** (d. 1993). *Professor of Biology and Science in Society, Wesleyan University, Middletown, Connecticut, 1982–93. Author of Animal Diversity.*
BIOLOGICAL SCIENCES, THE (in part)
- E.D.M. Ellis D. Miner.** *Cassini Science Manager, Jet Propulsion Laboratory.*

California Institute of Technology, Pasadena. Author of Uranus: The Planet, Rings and Satellites.

SOLAR SYSTEM, THE (*in part*)

Ed.R. **Edward Rosen** (d. 1985). *Distinguished Professor of the History of Science, City University of New York. Author of Three Imperial Mathematicians: Kepler Trapped Between Brake and Ursus.* KEPLER (*in part*)

E.D.S. **Evgeny Dmitrievich Silaev.** *Former Head, Department of the North and Transcaucasus, Council for Research on Productive Forces, U.S.S.R. Planning Committee, Moscow. Author of articles on Transcaucasian republics.* TRANSCAUCASIA (*in part*)

E.D.T.V. **Emily D. Townsend Vermeule.** *Samuel E. Zemurray and Doris Zemurray Stone-Radcliffe Professor Emerita of Classics, Harvard University. Author of Greece in the Bronze Age.*

GREEK AND ROMAN CIVILIZATIONS, ANCIENT (*in part*)

E.Du. **Enrique Dussel.** *Professor of Ethics, National Autonomous University of Mexico, Mexico City. Author of Les Évêques hispano-américaine (1504–1620) and others.*

LAS CASAS, BARTOLOMÉ DE (Micropædia)

E.E. **Elihu Elath** (d. 1990). *President, Hebrew University of Jerusalem, 1961–67. Ambassador of Israel to U.S., 1948–50, and to U.K., 1952–59. Author of Israel and Her Neighbours and others.*

ISRAEL (*in part*)

E.E.E. **E. Earle Ellis.** *Research Professor of Theology, Southwestern Baptist Theological Seminary, Ft. Worth, Texas. Author of The Gospel of Luke and others.* LUKE, SAINT (Micropædia)

E.Eg. **Emil Egli** (d. 1993). *Professor of Geography, Zürich Gymnasium. Lecturer, University of Zürich and Swiss Federal Institute of Technology, Zürich. Author of Switzerland and others.* SWITZERLAND (*in part*)

E.E.La. **Eric Edwin Lampard.** *Professor of History, State University of New York at Stony Brook.* CITIES (*in part*)

E.E.R. **Edgar Eugene Robinson** (d. 1977). *Margaret Byrne Professor of American History, Stanford University, California, 1931–52. Author of Evolution of American Political Parties and others.* UNITED STATES OF AMERICA (*in part*)

E.E.S. **Eustace E. Suckling.** *Honorary Professor of Electrical Engineering, University of Auckland, New Zealand. Author of Bioelectricity; The Living Battery.* ELECTRICITY AND MAGNETISM (*in part*)

E.E.Sn. **Esmond E. Snell.** *Ashbel Smith Professor Emeritus of Chemistry and of Microbiology, University of Texas at Austin. Editor of Pyridoxal Catalysis: Enzymes and Model Systems; Annual Review of Biochemistry (vol. 38–52).* NUTRITION (*in part*)

E.F. **Enno Franzius.** *Historian. Author of History of the Byzantine Empire.* HERACLIUS (Micropædia)

E.F.C. **Eduardo F. Catalano.** *Emeritus Professor of Architecture, Massachusetts Institute of Technology, Cambridge. Author of Structures of Warped Surfaces.* NERVI, PIER LUIGI (Micropædia)

E.F.G.D. **Emilio Fernando González Díaz.** *Professor of Geomorphology, University of Buenos Aires, Argentina.* SOUTH AMERICA (*in part*)

E.F.S. **Edward Fairbrother Strange** (d. 1925). *Keeper of Woodwork, Victoria and Albert Museum, London. Author of Chinese Lacquer and others.*

DECORATIVE ARTS AND FURNISHINGS (*in part*)

E.F.T. **Edward F. Tedesco.** *Senior Scientist, Mission Research Corporation, Nashua, New Hampshire.* SOLAR SYSTEM, THE (*in part*)

E.Fu. **Edmund Fuller.** *Writer and editor. Book Reviewer, Wall Street Journal. Coeditor of Four American Biographies and others.*

HOLMES, OLIVER WENDELL, JR. (Micropædia)

E.F.W. **Edward F. Wente.** *Professor of Egyptology, Oriental Institute and Department of Near Eastern Languages and Civilizations, University of Chicago. Author of Late Ramesside Letters.* EGYPT (*in part*)

E.F.Wo. **E.F. Wondris.** *Metallurgical consultant. Former Chief Metallurgical Engineer, National Steel Corporation, Pittsburgh, Pennsylvania.*

INDUSTRIES, EXTRACTION AND PROCESSING (*in part*)

E.G. **Evel Gasparini** (d. 1982). *Professor of Slavic Philology, University of Padova, Italy. Author of Il matriarcato slavo.* EUROPEAN RELIGIONS, ANCIENT (*in part*)

E.Ge. **Ettore Gelpi.** *Coordinator of the adult program, Council of Europe, Strasbourg, France. Lecturer, University of Paris I. Author of Lifelong Education and International Relations and others.* EDUCATION, HISTORY OF (*in part*)

E.G.E. **Ernest G. Ehlers.** *Emeritus Professor of Geology and Mineralogy, Ohio State University, Columbus. Author of The Interpretation of Geological Phase Diagrams and others.* MATTER (*in part*)

E.G.K. **E. Gordon Keith.** *Emeritus Professor of Finance, University of Pennsylvania, Philadelphia. Editor of Foreign Tax Policies and Economic Growth.* TAXATION (*in part*)

E.G.P. **Edwin G. Pulleyblank.** *Emeritus Professor of Chinese, University of British Columbia, Vancouver. Author of The Background of the Rebellion of An Lu-shan; Chinese History and World History; and others.* AN LU-SHAN (Micropædia)

E.G.R. **The Rev. Ernest Gordon Rupp** (d. 1986). *Dixie Professor of Ecclesiastical History, University of Cambridge,*

1968–77. Author of Luther's Progress to the Diet of Worms; coauthor of Erasmus and Luther and others.

LUTHER

Eg.S. **Egon Schaden** (deceased). *Emeritus Professor of Anthropology, University of São Paulo, Brazil. Author of Mitologia Heróica de Tribos Indígenas do Brasil and others.*

AMERICAN PEOPLES, NATIVE (*in part*)

E.G.S. **Edward G. Seidensticker.** *Emeritus Professor of Japanese, Columbia University. Author of Tokyo Rising: The City Since the Great Earthquake and many others.*

TOKYO-YOKOHAMA METROPOLITAN AREA

E.G.T. **Sir Eric Gardner Turner** (d. 1983). *Professor of Papyrology, University College, University of London, 1950–78; Director, Institute of Classical Studies, 1953–63. Author of Greek Papyri and many other works on papyri.* WRITING (*in part*)

E.Gu. **Erna Gunther** (d. 1982). *Professor of Anthropology, University of Washington, Seattle, 1941–67; Director, Thomas Burke Memorial Washington State Museum, 1929–67. Author of Art in the Life of the Northwest Coast Indians.*

AMERICAN PEOPLES, ARTS OF NATIVE (*in part*)

E.G.W. **Ernest Glen Wever** (d. 1990). *Higgins Professor of Psychology, Princeton University. Author of Theory of Hearing.* SENSORY RECEPTION (*in part*)

E.Ha. **Enriqueta Harris.** *Honorary Fellow of the Warburg Institute, University of London. Author of Goya; Velázquez; and others.*

GOYA, FRANCISCO DE (Micropædia)
VELÁZQUEZ (*in part*)

E.H.B. **Edward Howland Burt, Jr.** *Professor of Zoology, Ohio Wesleyan University, Delaware. Author of Coloration of Wood Warblers.* COLORATION, BIOLOGICAL (*in part*)

E.H.C. **Edward H. Carr** (d. 1982). *Wilson Professor of International Politics, University College of Wales, Aberystwyth, 1936–47. Author of Michael Bakunin and others.*

BAKUNIN, MIKHAIL ALEKSANDROVICH (Micropædia)

E.H.H. **Eckhard H. Hess** (d. 1986). *Professor of Psychology, University of Chicago, 1959–86. Author of Imprinting.* LORENZ, KONRAD (*in part*) (Micropædia)

E.H.P.B. **Sir Ernest Henry Phelps Brown** (d. 1994). *Professor of the Economics of Labour, University of London, 1947–68. Author of The Economics of Labour.* WORK AND EMPLOYMENT (*in part*)

E.H.St. **Elmer H. Stotz** (d. 1987). *Professor of Biochemistry, School of Medicine and Dentistry, University of Rochester, New York. Editor of Comprehensive Biochemistry.* BIOLOGICAL SCIENCES, THE (*in part*)

E.H.T. **Elias H. Tuma.** *Emeritus Professor of Economics, University of California, Davis. Author of Twenty-six*

Centuries of Agrarian Reform: A Comparative Analysis and others.

LAND REFORM AND TENURE

E.H.W., Jr. Edmund H. Worthy, Jr. Associate Director, The Smithsonian Associate, Smithsonian Institution, Washington, D.C. Founder, Journal of Sung Yuan Studies.

WANG AN-SHIH (Micropædia)

E.Hy. Eric Halfpenny (d. 1979). Editor, The Galpin Society Journal, 1963–70.

MUSICAL INSTRUMENTS (in part)

Ei.H. Einar Haugen (d. 1994). Victor S. Thomas Professor of Linguistics and Scandinavian, Harvard University, 1964–75. Author of Language Conflict and Language Planning: The Case of Modern Norwegian and others.

LANGUAGES OF THE WORLD (in part)

E.I.J.R. Erwin I.J. Rosenthal (d. 1991). Reader in Oriental Studies, University of Cambridge, 1959–71. Author of Political Thought in Medieval Islam; editor of Averroës' Commentary on Plato's Republic.

AVERROËS (Micropædia)

E.I.U. Economist Intelligence Unit, The Economist, London.

BRAZIL (in part)

CHINA (in part)

CZECH AND SLOVAK REPUBLICS (in part)

EGYPT (in part)

INDONESIA (in part)

POLAND (in part)

SOUTHERN AFRICA (in part)

SUDAN, THE (in part)

UNITED STATES OF AMERICA (in part)

E.J. Emrys Jones. Emeritus Professor of Geography, London School of Economics and Political Science, University of London. Author of Social Geography of Belfast and others.

UNITED KINGDOM (in part)

E.J.Bi. E.J. Bickerman (d. 1981). Professor of Ancient History, Columbia University, 1952–67. Author of Chronology of the Ancient World.

CALENDAR (in part)

E.J.C. Eric J. Chaisson. Senior Scientist, Space Telescope Science Institute, Baltimore, Maryland. Author of Cosmic Dawn and others.

STARS AND STAR CLUSTERS (in part)

E.J.E. Eugene J. Enrico. Professor of Music, University of Oklahoma, Norman. Writer and producer of programs on music for public television.

MUSICAL INSTRUMENTS (in part)

E.J.F. Sir Edgar John Forsdyke (d. 1979). Director and Principal Librarian, British Museum, London, 1936–50; Keeper of Greek and Roman Antiquities, 1932–36.

DECORATIVE ARTS AND FURNISHINGS (in part)

E.J.G. Elmer J. Gutherz. Division Chief, Resource Assessment Surveys, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Pascagoula, Mississippi. Researcher on the biology of a variety of marine fishes.

FISHES (in part)

E.J.J. E. Jaakko Järvinen. Chief of Department, Finnish Institute of Leadership, Helsinki. Editor of Contemporary Research in Psychology of Perception.

PERCEPTION, HUMAN (in part)

E.J.K. E. Jane Keyes. Writer and editor. Editor of Siam and World War II.

SOUTHEAST ASIA (in part)

E.J.Ke. Edward John Kenney. Kennedy Professor Emeritus of Latin, University of Cambridge. Author of The Classical Text; Lucretius; and others.

HISTORY, THE STUDY OF (in part)

OVID (Micropædia)

PETRONIUS ARBITER, GAIUS (in part)

(Micropædia)

E.J.M.R. Edward J.M. Rhoads. Associate Professor of History, University of Texas at Austin. Author of China's Republican Revolution: The Case of Kwangtung, 1895–1913.

LIN BIAO (Micropædia)

E.J.S. Sir Edward James Salisbury (d. 1978). Director, Royal Botanic Gardens, Kew, England, 1943–56. Author of The Living Garden; The Reproductive Capacity of Plants; and others.

LINNAEUS, CAROLUS (Micropædia)

E.J.W. Edwin J. Westermann. Emeritus Professor of History, University of Missouri, Kansas City.

UNITED STATES OF AMERICA (in part)

E.J.W.B. Ernest J.W. Barrington (d. 1985). Professor of Zoology, University of Nottingham, England, 1949–74. Author of Introduction to General and Comparative Endocrinology.

BIOCHEMICAL COMPONENTS OF ORGANISMS (in part)

E.J.Wi. E.J. Wiesenberg. Member, Taylor-Schechter Cairo Genizah Research Unit, University of Cambridge Library. Former Reader in Hebrew, University College, University of London. Editor and translator of Abraham Maimonides' Commentary on Genesis and Exodus.

CALENDAR (in part)

HISTORY, THE STUDY OF (in part)

E.J.Wo. Edward J. Wormley. Products and interior designer. Former Design Director, Dunbar Furniture Corporation of Indiana, New York City.

DECORATIVE ARTS AND FURNISHINGS (in part)

E.K. Edgar Kaufmann, Jr. (d. 1989). Adjunct Professor of the History of Architecture, Columbia University. Director, Department of Industrial Design, Museum of Modern Art, New York City, 1946–50. Coauthor and editor of The Rise of an American Architecture; coeditor of Frank Lloyd Wright: Writings and Buildings.

WRIGHT, FRANK LLOYD (in part)

(Micropædia)

E.Ka. Edwin Kashy. Professor of Physics, Michigan State University, East Lansing.

ELECTRICITY AND MAGNETISM (in part)

E.K.B. Eugene Kornel Balon. Professor of Zoology, University of Guelph, Ontario.

Editor in Chief, Environmental Biology of Fishes.

FISHES (in part)

E.Ke. Elie Kedourie (d. 1992). Professor of Politics, London School of Economics and Political Science, University of London, 1965–90. Author of Afghani and 'Abduh: An Essay on Religious Unbelief and Political Activism in Modern Islam.

JAMÁL AD-DIN AL-AFGHĀNĪ (Micropædia)

E.K.W. Sir Ellis K. Waterhouse (d. 1985). Director of Studies, Paul Mellon Centre for Studies in British Art, London, 1970–73. Barber Professor of Fine Arts; Director, Barber Institute of Fine Arts, University of Birmingham, England, 1952–70. Author of Italian Baroque Painting and others.

CORREGGIO (Micropædia)

E.L. Edward Lockspeiser (d. 1973). Writer and broadcaster on music. Author of Debussy: His Life and Mind.

DEBUSSY, CLAUDE (Micropædia)

DIAGHILEV, SERGEY (Micropædia)

MENDELSSOHN, FELIX (in part)

(Micropædia)

E.L.B. Edward L. Bousfield. Curator Emeritus, Zoology Division, National Museum of Natural Sciences, Ottawa. Researcher Emeritus, Canadian Museum of Nature, Ottawa.

CRUSTACEANS (in part)

E.L.H. The Most Rev. Edward Louis Heston, C.S.C. (d. 1973). Chairman, Pontifical Social Communications Commission, Vatican City, 1971–73. Author of The Holy See at Work.

PAUL VI (PAPACY) (Micropædia)

E.Li. Edwin Lieuwen (deceased). Professor of Latin-American History, University of New Mexico, Albuquerque. Author of Venezuela and others.

VENEZUELA (in part)

E.L.K. Edward Louis Keenan. Andrew W. Mellon Professor of the Humanities, Harvard University. Author of The Kurbskii-Groznyi Apocrypha: The Seventeenth-Century Genesis of the "Correspondence" Between Ivan IV and A.M. Kurbskii.

RUSSIA (in part)

E.L.L. Emiel L. Lamberts. Professor of Modern Political and Religious History, Catholic University of Louvain, Belgium. Author of De Kruistocht tegen het liberalisme: facetten van het ultramontanisme in België in de 19e eeuw and others.

BELGIUM (in part)

El.M. Eli Maor. Adjunct Professor of Mathematics, Loyola University, Chicago, Illinois. Author of June 8, 2004: Venus in Transit; Trigonometric Delights; and others.

TRIGONOMETRY (in part)

E.Lo. Elizabeth Pakenham, Countess of Longford. Writer. Author of Wellington: The Years of the Sword; Wellington: The Pillar of the State.

WELLINGTON

El.R. Elliott Rudwick (d. 1985). Professor of Sociology and of History; Senior

Research Fellow, Center for Urban Regionalism, Kent State University, Ohio. Author of W.E.B. Du Bois: Propagandist of the Negro Protest.

DU BOIS, W.E.B. (Micropædia)

E.L.T. Edward Lewis Turner, M.D. (d. 1960). *Secretary, Council on Medical Education and Hospitals, American Medical Association, Chicago, 1953–59. Professor of Medicine; Dean, School of Medicine, University of Washington, Seattle, 1945–53.*

MEDICINE (in part)

E.L.Y. Ellen Louise Young. *Historical research specialist (manufactures).*

DECORATIVE ARTS AND FURNISHINGS (in part)

E.M. Eric Mendoza. *Emeritus Professor of Science Teaching, Hebrew University of Jerusalem. Editor of Sadi Carnot's Reflections on the Motive Power of Fire.*

CARNOT, SADI (Micropædia)

E.Ma. Erich Matthias (d. 1983). *Professor of Contemporary History and Political Science, University of Mannheim, West Germany. Author of Sozialdemokratie und Nation and others.*

BEBEL, AUGUST (Micropædia)

E.M.B. Eugene M. Berkman, M.D. *Medical Director, Blood Bank, New England Medical Center Hospital; Professor of Medicine, Tufts University, Boston. Editor of Fundamentals of a Pheresis Program.*

BLOOD (in part)

E.McN.E. Ernest McNeill Eller. *Rear Admiral, U.S. Navy (retired). Author of The Soviet Sea Challenge and others; coeditor of Dictionary of American Naval Fighting Ships.*

WAR, THE TECHNOLOGY OF (in part)

E.M.G. Ernest M. Gifford. *Emeritus Professor of Botany, University of California, Davis. Coauthor of Morphology and Evolution of Vascular Plants.*

FERNS (in part)

GYMNOSPERMS (in part)

E.M.J.C. Eila M.J. Campbell (d. 1994). *Professor of Geography, Birkbeck College, University of London.*

GAMA, VASCO DA, 1st CONDE DA VIDIGUEIRA (Micropædia)

GIOVANNI DA PIAN DEL CARPINI (Micropædia)

E.M.R. Edwin M. Ripin (d. 1975). *Assistant Curator, Musical Instruments Department, Metropolitan Museum of Art, New York City, 1970–73. Editor of Keyboard Instruments.*

MUSICAL INSTRUMENTS (in part)

E.M.W. Edmund Merriman Wise (d. 1972). *Assistant to the Vice President of Research, International Nickel Company, New York City, 1955–61. Author of Palladium: Recovery, Properties, and Uses.*

INDUSTRIES, EXTRACTION AND PROCESSING (in part)

E.M.Wn. Elizabeth M. Wilkinson. *Emeritus Professor of German, University of London. Coauthor of Goethe: Poet and Thinker and others.*

GOETHE (in part)

E.N. Edward Norbeck (d. 1991). *Professor of Anthropology, Rice University, Houston, Texas, 1962–81. Author of Religion in Primitive Society and others.*

RELIGIOUS AND SPIRITUAL BELIEF, SYSTEMS OF (in part)

rites and CEREMONIES, SACRED (in part)

E.N.A. Edward Noah Abrahart. *Former Assistant Research Manager, Clayton Aniline Co. Ltd., Manchester, England. Author of Dyes and Their Intermediates.*

INDUSTRIES, CHEMICAL PROCESS (in part)

INDUSTRIES, TEXTILE (in part)

E.N.S. Eric Norman Simons (d. 1983). *Author of The Queen and the Rebel: Mary Tudor and Wyatt the Younger and others.*

MARY I (ENGLAND AND GREAT BRITAIN) (Micropædia)

E.N.So. Estanislao Navarro Sosa. *Manager, Space Products, Electron Dynamics Division, Hughes Aircraft Company, Torrance, California.*

ELECTRONICS (in part)

E.O.G.T.-P. E.O.G. Turville-Petre (d. 1978). *Professor of Ancient Icelandic Literature and Antiquities, University of Oxford, 1953–75. Author of Myth and Religion of the North and others.*

EUROPEAN RELIGIONS, ANCIENT (in part)

SCANDINAVIAN LITERATURE (in part)

E.O.J. The Rev. Edwin Oliver James (d. 1972). *Chaplain of All Souls College, University of Oxford. Professor of the History and Philosophy of Religion, University of London. Author of Seasonal Feasts and Festivals and numerous other works in the comparative study of religions.*

rites and CEREMONIES, SACRED (in part)

SACRED OFFICES AND ORDERS (in part)

E.O.W. Edwin O. Willis. *Professor of Zoology, São Paulo State University "Julio de Mesquita Filho," Rio Claro, Brazil. Author of The Behavior of Bicolored Antbirds.*

BEHAVIOUR, ANIMAL (in part)

E.P.A. E. Paul Albury, D.D.S. (d. 1987). *Senator of The Bahamas. Author of The Story of the Bahamas.*

WEST INDIES, THE (in part)

E.Pe. Edward Pessen (d. 1992). *Distinguished Professor of History, Baruch College and the Graduate Center, City University of New York, 1972–92. Author of Jacksonian America and others.*

UNITED STATES OF AMERICA (in part)

E.P.E. Elizabeth Pat Ebanks. *Information Officer, Government of the Cayman Islands, George Town.*

WEST INDIES, THE (in part)

E.P.H. Eric P. Hamp. *Robert Maynard Hutchins Distinguished Service Professor Emeritus of Linguistics, of Psychology, and of Slavic Languages; Director, Center for Balkan and Slavic Studies, University of Chicago. Coeditor of Readings in Linguistics, I & II.*

LANGUAGES OF THE WORLD (in part)

LINGUISTICS (in part)

E.Po. Ernesto Pontieri (deceased). *Professor of Medieval and Modern History, University of Naples. Author of Tra i Normanni nell'Italia meridionale.*

BIOSPHERE, THE (in part)

ROBERT (APULIA) (Micropædia)

E.P.S. Ellis P. Steinberg (d. 1991). *Director, Chemistry Division, Argonne National Laboratory, Argonne, Illinois, 1982–88; Section Head, Nuclear and Inorganic Chemistry, 1974–82.*

ATOMS (in part)

E.P.Sa. Edward P. Sanders. *E.P. Sanders Arts and Science Professor of Religion, Duke University. Author of Jesus and Judaism; The Historical Figure of Jesus.*

JESUS (in part)

E.P.Y. Ernest P. Young. *Professor of History, University of Michigan, Ann Arbor. Author of The Presidency of Yuan Shih-k'ai: Liberalism and Dictatorship in Early Republican China.*

CHINA (in part)

E.R.A.F. Enid R.A. Forde. *Former Professor of Geography, Fourah Bay College, University of Sierra Leone, Freetown.*

WESTERN AFRICA (in part)

E.R.G. Edna R. Green. *Former Head, Science Department, Philadelphia High School for Girls. Coauthor of Biology.*

BIOLOGICAL SCIENCES, THE (in part)

E.R.Ha. Edward R. Hardy (d. 1981). *Lecturer in Early Church History, University of Cambridge, 1969–75. Professor of Church History, Berkeley Divinity School, New Haven, Connecticut, 1947–69. Author of Christian Egypt: Church and People; editor of Christology of the Later Fathers; Faithful Witnesses.*

ATHANASIUS, SAINT (Micropædia)

BASIL THE GREAT, SAINT (Micropædia)

GREGORY OF NAZIANZUS, SAINT (Micropædia)

GREGORY OF NYSSA, SAINT (Micropædia)

Er.L. Erik Lassen. *Director, Museum of Decorative Art, Copenhagen, 1966–82. Author of Danish Furniture of the Classical Age and others.*

DECORATIVE ARTS AND FURNISHINGS (in part)

E.R.-M. Emir Rodríguez-Monegal (d. 1985). *Professor of Latin American and Comparative Literature, Yale University. Author of Borgès par lui-même.*

BORGES, JORGE LUIS (Micropædia)

E.R.S. Ernest R. Sandeen (d. 1982). *Professor of History, Macalester College, St. Paul, Minnesota, 1973–82. Author of The Roots of Fundamentalism: British and American Millenarianism 1800–1930.*

DOCTRINES AND DOGMAS, RELIGIOUS (in part)

FUNDAMENTALISM (in part) (Micropædia)

E.R.Se. Elman R. Service (d. 1996). *Professor of Anthropology, University of California, Santa Barbara, 1968–85. Investigator of the economic and social organization of primitive cultures. Author of Primitive Social Organization.*

CULTURE, THE CONCEPT AND COMPONENTS OF (in part)

PARAGUAY (in part)

E.Ru. Eleanor Ruggles. *Biographer. Author of Prince of Players: Edwin Booth and others.*

BOOTH, EDWIN (Micropædia)

E.R.W. Ewald R. Weibel, M.D. *Emeritus Professor of Anatomy, University of Bern, Switzerland. Author of The Pathway for Oxygen.*

RESPIRATION AND RESPIRATORY SYSTEMS (in part)

Er.We. Eric Weil. *Sports Editor, Buenos Aires (Argentina) Herald.*

SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

E.Sa. Emilio Sáez (d. 1988). *Professor of Medieval Spanish History, University of Barcelona, Spain, 1959–78. Professor of Medieval History, University of Madrid, 1980–86. Author of Colección diplomática de Sepúlveda.*

ALFONSO V (SPAIN: ARAGON) (Micropædia)
ALFONSO VI (SPAIN: CASTILE AND LEON) (Micropædia)

JAMES I (SPAIN: ARAGON) (Micropædia)

E.S.D. Eleanor Shipley Duckett (d. 1976). *Professor of Classical Languages and Literature, Smith College, Northampton, Massachusetts, 1928–49. Author of The Gateway to the Middle Ages; Carolingian Portraits; and others.*

CHARLES MARTEL (in part) (Micropædia)
PEPIN III (CAROLINGIAN DYNASTY) (Micropædia)

E.S.H. Eric S. Higgs (d. 1976). *Director of Research, Faculty of Archaeology and Anthropology, University of Cambridge. Coeditor of Science in Archaeology.*

AGRICULTURE, THE HISTORY OF (in part)

E.S.M. Edmund S. Muskie (d. 1996). *United States Secretary of State, 1980–81. U.S. Senator from Maine, 1959–80; Governor, 1955–59. Author of Journeys.*

UNITED STATES OF AMERICA (in part)

E.S.P. Edward S. Perkins, M.D. *Emeritus Professor of Ophthalmology, University of Iowa, Iowa City. Coauthor of Atlas of Diseases of the Eye.*

SENSORY RECEPTION (in part)

E.S.R. Evelyn S. Rawski. *Professor of History, University of Pittsburgh. Author of Education and Popular Literacy in Ch'ing China.*

CHINA (in part)

E.S.Ri. Eric Stapleton Richards. *Professor of History, Flinders University of South Australia, Adelaide. Author of A History of the Highland Clearances; editor of The Flinders History of South Australia.*

AUSTRALIA (in part)

E.T. Ettore Toffoletto, M.D. *President of the Administration Council, Arts Academy, Bologna, Italy. Author of Discorso sul Malpighi and others.*

MALPIGHI, MARCELLO (in part) (Micropædia)

E.t.H. Ernst ten Haaf. *Former Professor of Structural Geology, State University of Utrecht, The Netherlands.*

MINERALS AND ROCKS (in part)

E.Th. Sir Eric Thompson (d. 1975). *Staff member, Department of Archaeology,*

Carnegie Institution of Washington, D.C., 1935–58. Author of The Rise and Fall of Maya Civilization.

HISTORY, THE STUDY OF (in part)

E.To. Elisabeth Tooker. *Emerita Professor of Anthropology, Temple University, Philadelphia. Author of The Iroquois Ceremonial of Midwinter.*

AMERICAN PEOPLES, NATIVE (in part)

E.Tr. Erik Trinkaus. *Professor of Anthropology, University of New Mexico, Albuquerque. Author of The Shanidar Neandertals.*

EVOLUTION, HUMAN (in part)

E.T.S. Edward Togo Salmon (d. 1988). *Messecar Professor of History, McMaster University, Hamilton, Ontario, 1954–73. Author of A History of the Roman World from 30 B.C. to A.D. 138 and others.*

GREEK AND ROMAN CIVILIZATIONS, ANCIENT (in part)

E.T.Sa. Emilie T. Sander (d. 1976). *Associate Professor of New Testament, Yale University, 1973–75. Coeditor and translator of The Bible and the Role of Women.*

BIBLICAL LITERATURE AND ITS CRITICAL INTERPRETATION (in part)

E.T.W. Sir Edgar Trevor Williams (d. 1995). *Secretary, Rhodes Trust, 1959–80. Pro-Vice-Chancellor, University of Oxford, 1968–80; Fellow of Balliol College, Oxford, 1945–80. Editor, Dictionary of National Biography, 1949–80.*

VICTORIA AND THE VICTORIAN AGE (in part)

Eu.M.A. Eufonio M. Alip (deceased). *President, Philippine National Historical Society. Editor, Journal of History (quarterly), President and Manager, Alip & Sons, Inc. (publishing firm), Manila. Author of Political and Cultural History of the Philippines and others.*

PHILIPPINES (in part)

E.V. Eugene Vanderpool (d. 1989). *Professor of Archaeology, American School of Classical Studies at Athens, 1949–71.*

ATHENS (in part)

OLYMPIA (Micropædia)

E.Va. Ernesto Valgiglio (d. 1990). *Professor of Greek and Latin Grammar, University of Genoa. Author of Silla e la crisi repubblicana.*

SULLA, LUCIUS CORNELIUS (Micropædia)

E.V.B.B. Eric V.B. Britter (d. 1977). *Foreign Correspondent, The Times (London), 1944–69.*

WEST INDIES, THE (in part)

E.v.H. Ernst van Heerden. *Poet and critic. Emeritus Professor of Afrikaans and Netherlands, University of the Witwatersrand, Johannesburg. Author of Die klop and many others.*

SOUTH AFRICAN LITERATURE (in part) (Micropædia)

E.Vi. Eugène Vinaver (d. 1979). *Professor of French Language and Literature, Victoria University of Manchester, 1933–66. Author of The Rise of Romance; editor of The Works of Sir Thomas Malory.*

LITERATURE, THE ART OF (in part)

Ev.S. Eva Schaper (d. 1992). *Titular Professor of Logic, 1977–90; Head, Department of Logic, University of Glasgow, Scotland, 1982–84. Author of Prelude to Aesthetics and others.*

TROELTSCH, ERNST (Micropædia)

Ev.W. Evert Werkman (d. 1988). *Columnist, Het Parool, Amsterdam. Author of Amsterdam, 'n stad op palen and others.*

AMSTERDAM (in part)

E.W. Edward Weintal (d. 1973). *Diplomatic Correspondent, Chief European Correspondent, and Contributing Editor, Newsweek magazine, 1944–69. Coauthor of Facing the Brink: An Intimate Study of Crisis Diplomacy.*

DULLES, JOHN FOSTER (Micropædia)

E.W.A. Edward W. Anderson (d. 1983). *Navigational Adviser, Aviation Division, Smiths Industries Ltd., Cheltenham, England. Author of Principles of Navigation.*

NAVIGATION (in part)

E.W.B. Ernst Wilhelm Benz (d. 1978). *Professor of Church History, Philipps University of Marburg, West Germany. Author of Evolution and Christian Hope.*

CHRISTIANITY (in part)

E.We. Elisabeth Weis. *Professor of Film, Brooklyn College and Graduate Center, City University of New York. Coeditor of Film Sound: Theory and Practice.*

MOTION PICTURES (in part)

E.W.G. Eric William Gray (d. 1990). *Lecturer in Ancient History, University of Oxford; Official Student and Tutor in Roman History, Christ Church, Oxford, 1939–77. Editor of Greenidge and Clay's Sources for Roman History (133–70 B.C.)*

POMPEY THE GREAT (in part) (Micropædia)

E.Wi. Edward Wichers (d. 1984). *Associate Director, National Bureau of Standards, U.S. Department of Commerce, Washington, D.C., 1958–62; Chief, Division of Chemistry, 1948–58. Author of papers on chemical reagents, pure substances, and atomic weights.*

ATOMIC WEIGHT (in part) (Micropædia)

E.Wn. Elizabeth Wiskemann (d. 1971). *Montague Burton Professor of International Relations, University of Edinburgh, 1958–61. Tutor in Modern History, University of Sussex, England, 1961–64. Author of Czechs and Germans and others.*

CZECH AND SLOVAK REPUBLICS (in part)

E.W.P. Edward W. Price. *Regents' Professor Emeritus of Aerospace Engineering, Georgia Institute of Technology, Atlanta.*

ENERGY CONVERSION (in part)

E.W.Z. Ernst Walter Zeeden. *Emeritus Professor of Modern and Medieval History, Eberhard Karl University of Tübingen, Germany.*

STEIN, KARL, REICHSFREIHERR VOM UND ZUM (Micropædia)

E.Z. Erik Zürcher. *Professor of East Asian History, State University of Leiden, The Netherlands. Author of The Buddhist Conquest of China.*

CHINA (in part)

E.Z.H. E. Zudaire Huarte (deceased). *Instructor, Good Counsel Academy, Lecaroz, Spain. Author of El conde-duque y Cataluña.*

OLIVARES, GASPAR DE GUZMÁN Y PIMENTAL, CONDE-DUQUE DE (in part) (Micropædia)

E.Zö Erich Zöllner. *Emeritus Professor of Austrian History, University of Vienna. Author of Geschichte Österreichs von den Anfängen bis zur Gegenwart and others.* AUSTRIA (in part)

F.A.A. Francis A. Allen. *Huber C. Hurst Professor Emeritus of Law, University of Florida, Gainesville. Edson R. Sunderland Professor Emeritus of Law, University of Michigan, Ann Arbor. Author of The Decline of the Rehabilitative Ideal.*

BECCARIA, CESARE (Micropædia)

ERSKINE, THOMAS ERSKINE, 1ST BARON (in part) (Micropædia)

F.A.B. Frank A. Brown, Jr. (d. 1983). *Morrison Professor of Biology, Northwestern University, Evanston, Illinois, 1956–76. Coauthor of Comparative Animal Physiology; The Biological Clock: Two Views.*

BEHAVIOUR, ANIMAL (in part)

COLORATION, BIOLOGICAL (in part)

F.A.C. F. Albert Cotton. *Robert A. Welch Professor of Chemistry, Texas A&M University, College Station. Author of Chemical Applications of Group Theory.* CHEMICAL ELEMENTS (in part)

F.A.Ca. Francis A. Carey. *Associate Professor of Chemistry, University of Virginia, Charlottesville. Author of Organic Chemistry and others.*

CHEMICAL COMPOUNDS (in part)

F.A.L. Frank Andrew Leeming (deceased). *Senior Lecturer in Geography, University of Leeds, England.* CHINA (in part)

F.A.P. Frederick A. Pottle. (d. 1987). *Sterling Professor of English, Yale University, 1944–66. Author of James Boswell: The Earlier Years, 1740–1769; The Literary Career of James Boswell; and others.*

BOSWELL, JAMES (in part) (Micropædia)

F.B. François Bernard. *Conseiller d'État, a judicial rank in the Council of State, Paris. Director, Civil and Military Cabinet, Ministry of Defense, Government of France, 1981–85.*

FRANCE (in part)

F.Ba. Frank Barlow. *Emeritus Professor of History, University of Exeter, England. Author of William I and the Norman Conquest and others.*

WILLIAM I (ENGLAND AND GREAT BRITAIN) (Micropædia)

F.B.B. Frank Bagnall Bessac. *Emeritus Professor of Anthropology, University of Montana, Missoula. Author of Culture Types of Northern and Western China.* ASIAN PEOPLES AND CULTURES (in part)

F.B.C. Floyd Barton Chapman. *Ecologist, Metropolitan Park District, Columbus, Ohio. Author of The Ruffed Grouse and Its Management in Ohio.*

FALCONRY (in part) (Micropædia)

F.Be. Fernando Benítez. *Writer and editor. Former Professor of Journalism, National Autonomous University of Mexico, Mexico City. Author of Los Indios Mexicanos and others.* MEXICO CITY (in part)

F.B.G. Frank B. Gibney. *Vice-Chairman, Board of Editors, Encyclopædia Britannica, Inc., Chicago. Vice-Chairman, TBS-Britannica Company Ltd., Tokyo. Author of The Khrushchev Pattern.* KHRUSHCHEV, NIKITA (Micropædia)

F.Br. Friedrich Blendinger. *Director of Archives, Augsburg, West Germany, 1966–77. Author of Bevölkerungsgeschichte einer deutschen Reichsstadt im Zeitalter der Glaubenskämpfe.*

FUGGER FAMILY (Micropædia)

F.B.S. F. Bruce Sampson. *Reader in Botany, Victoria University of Wellington, New Zealand. Author of Early New Zealand Botanical Art.*

ANGIOSPERMS (in part)

F.B.T. Frederick B. Tolles (d. 1975). *Howard M. Jenkins Professor of Quaker History and Research, 1954–70; Director, Friends Historical Library, Swarthmore College, Pennsylvania, 1941–70. Author of The Witness of William Penn and others.*

PENN, WILLIAM (in part) (Micropædia)

F.C. Federico Cheever. *Professor of Environmental Law, University of Denver, Colorado.*

ENVIRONMENTALISM AND ENVIRONMENTAL LAW (in part)

F.C.C. Frederick C. Crews. *Emeritus Professor of English, University of California, Berkeley. Author of Skeptical Engagements and others.*

LITERATURE, THE ART OF (in part)

F.C.D.III. Frederick C. Durant III. *Aerospace historian. Assistant Director, Astronautics, National Air and Space Museum, Smithsonian Institution, Washington, D.C., 1965–81.*

EXPLORATION (in part)

WAR, THE TECHNOLOGY OF (in part)

F.C.F. Sir Frank C. Francis (d. 1988). *Director and Principal Librarian, British Museum, London, 1959–68. Editor of The Bibliographical Society, 1892–1942: Studies in Retrospect; The Treasures of the British Museum.*

HISTORY, THE STUDY OF (in part)

LIBRARIES (in part)

F.C.Gi. Frances Carney Gies. *Coauthor of Leonard of Pisa and the New Mathematics of the Middle Ages.* LEONARDO PISANO (in part) (Micropædia)

F.Ch. Françoise Choay. *Professor of Urban Studies, University of Paris VIII. Author of Le Corbusier and others.* CORBUSIER, LE (in part) (Micropædia)

F.C.H. F. Clark Howell. *Professor of Anthropology, University of California, Berkeley. Author of Early Man.*

EVOLUTION, HUMAN (in part)

F.C.Ke. Fenton Crosland Kelley. *Emeritus Professor of Zoology, Boise State University, Idaho.*

EXCRETION AND EXCRETORY SYSTEMS (in part)

F.C.M. Frederick C. Mosher (d. 1990). *Henry L. and Grace Doherty Foundation Professor of Government and Foreign Affairs, University of Virginia, Charlottesville, 1968–80. Author of Democracy and the Public Service.* PUBLIC ADMINISTRATION (in part)

F.C.O. Francis Christopher Oakley. *President Emeritus; Professor of History, Williams College, Williamstown, Massachusetts. Author of Council Over Pope? Towards a Provisional Ecclesiology and others.*

ROMAN CATHOLICISM (in part)

F.C.P. Forrest C. Pogue (d. 1996). *Director, Dwight D. Eisenhower Institute for Historical Research, Smithsonian Institution, Washington, D.C., 1974–84. Director, George C. Marshall Research Library, Lexington, Virginia, 1964–74. Author of George C. Marshall.*

MARSHALL, GEORGE C. (Micropædia)

F.C.S. Frank C. Shoemaker. *Emeritus Professor of Physics, Princeton University. Authority on the design of apparatus for studying subatomic particles.*

PARTICLE ACCELERATORS (in part)

F.D.H. F.D. Hobbs (d. 1978). *Head, Environmental Modelling and Survey Unit, University of Birmingham, England. Author of Traffic Planning and Engineering.*

TRANSPORTATION (in part)

F.Do. Filippo Donini (d. 1990). *Cultural Expert, Cultural Relations Department, Italian Ministry of Foreign Affairs, Rome, 1972–76. Director, Italian Institute, London, 1961–72. Author of Vita e poesia di Sergio Corazzini.*

ITALIAN LITERATURE (in part)

F.D.O. Francis D. Ommanney (d. 1980). *Reader in Marine Biology, University of Hong Kong, 1957–60. Scientific staff member, Discovery Committee, 1929–39. Author of South Latitude and North Cape and others.*

BYRD, RICHARD E. (in part) (Micropædia)

F.D.P. Franklin D. Parker. *Emeritus Professor of History, University of North Carolina at Greensboro. Author of The Central American Republics and others.* CENTRAL AMERICA (in part)

F.E.B. Frederick E. Bacon. *Former Metallurgical Engineer, Metals Division, Union Carbide Corporation, Niagara Falls, New York.*

INDUSTRIES, EXTRACTION AND PROCESSING (in part)

F.E.Bl. Floyd E. Bloom, M.D. *Chairman, Department of Neuropharmacology, Scripps Research Institute, La Jolla, California. Editor in Chief, Science magazine. Coauthor of Biochemical Basis of Neuropharmacology and others.* DRUGS AND DRUG ACTION (in part)

F.E.G. Frank E. Goodwin. *Vice President, Materials Sciences, International Lead Zinc Research Organization, Research Triangle Park,*

North Carolina. Editor of *Engineering Properties of Zinc Alloys*.
INDUSTRIES, EXTRACTION AND PROCESSING (in part)

F.E.K. Frank E. Keating (d. 1995). *Fishing Editor*, Newsday, Garden City, New York, 1977–80.
FISHING (in part) (Micropædia)

F.E.Ki. F.E. Kirby. *Emeritus Professor of Music*, Lake Forest College, Illinois. *Author of An Introduction to Western Music and others*.
MUSICAL FORMS AND GENRES (in part)

F.E.M. Frank Edward Manuel. *Emeritus Professor of History*, Brandeis University, Waltham, Massachusetts. *Author of Shapes of Philosophical History and others*.
RELIGIOUS AND SPIRITUAL BELIEF, SYSTEMS OF (in part)

F.E.R. Frank E. Reynolds. *Professor of Buddhist Studies and History of Religions*, University of Chicago. *Author of Guide to Buddhist Religion*.

ANGKOR (in part) (Micropædia)
BUDDHISM, THE BUDDHA AND (in part)
JAYAVARMA VII (Micropædia)

F.F. Finn Fuglestad. *Professor of History*, University of Oslo, Norway. *Author of A History of Niger, 1850–1960*.
WESTERN AFRICA (in part)

F.F.B. Frederick Fyvie Bruce (d. 1990). *Rylands Professor of Biblical Criticism and Exegesis*, Victoria University of Manchester, England, 1959–78. *Author of The Canon of Scripture and others*.
BIBLICAL LITERATURE AND ITS CRITICAL INTERPRETATION (in part)

F.F.C. Frederick F. Cartwright. *Emeritus Senior Lecturer in the History of Medicine*, King's College Hospital, University of London. *Author of Joseph Lister*.
LISTER, JOSEPH, BARON LISTER, OF LYME REGIS (Micropædia)

F.Fe. Fritz Fellner. *Emeritus Professor of Modern History*, University of Salzburg, Austria. *Author of Schicksalsjahre Österreichs and others*.
AUSTRIA (in part)

F.F.E. Fredric F. Ehrlich. *Consultant. Staff Engineer*, Aircraft Engine Business Group, General Electric Company, Lynn, Massachusetts, 1982–93.
ENERGY CONVERSION (in part)

F.Fo. Frieda Fordham (deceased). *Training analyst*, Society of Analytical Psychology, London. *Author of An Introduction to Jung's Psychology and others*.
JUNG, CARL (in part) (Micropædia)

F.Fr. Frank Freidel (d. 1993). *Bullitt Professor of History*, University of Washington, Seattle, 1981–86. *Charles Warren Professor of American History*, Harvard University, 1972–81. *Author of America in the Twentieth Century; Franklin D. Roosevelt*.
ROOSEVELT, FRANKLIN D.
UNITED STATES OF AMERICA (in part)

F.G. Frankdieter Grimm. *Deputy Director*, Institute of Regional Geography,

Leipzig, Germany. *Author of Das Abflussverhalten in Europa and others*.
EUROPE (in part)

F.G.N. Fred G. Notehelfer. *Professor of History*, University of California, Los Angeles. *Author of American Samurai: Captain L.L. Janes and Japan*.
JAPAN (in part)

F.Go. Frederick Goldbeck (d. 1981). *Critic and musicologist. Adviser for Music*, Radiotélévision Française. *Author of The Perfect Conductor and others*.
GOUNOD, CHARLES (Micropædia)

F.Gre. Frank Greenaway. *Keeper*, Department of Chemistry, Science Museum, London, 1967–80. *Author of John Dalton and the Atom; editor of Lavoisier's Essays, Physical and Chemical*.
MENDELEYEV, DMITRY IVANOVICH (Micropædia)

F.Gu. The Rev. Franco Guerello, S.J. *Professor of Italian Literature*, Social Institute, Turin, Italy. *Editor of Lettere di Innocenzo IV dai cartolari notarili genovesi*.
INNOCENT IV (Micropædia)

F.H. François Haverschmidt (deceased). *Ornithologist. Author of Birds of Surinam and numerous articles on neotropical birds*.
BIRDS (in part)

F.Ha. Felix Haurowitz (d. 1987). *Distinguished Professor of Chemistry*, Indiana University, Bloomington. *Author of Chemistry and Function of Proteins*.
BIOCHEMICAL COMPONENTS OF ORGANISMS (in part)

F.H.B. Frederick Henry Boland (d. 1985). *Chancellor*, University of Dublin, 1964–82. *Representative of Ireland to the United Nations*, 1956–64.
IRELAND (in part)

F.Hi. Finn Hiorthøy. *Judge of the Supreme Court of Norway*, Oslo, 1955–73.
LEGAL SYSTEMS, THE EVOLUTION OF MODERN WESTERN (in part)

F.H.M. Franz H. Michael (d. 1992). *Professor of Far Eastern History and International Affairs*, George Washington University, Washington, D.C., 1964–77. *Author of The Origin of Manchu Rule in China and others*.
NURHACHI (Micropædia)

F.H.O. Frederick Henry Osborn (d. 1981). *Chairman, Executive Committee*, Population Council, New York City, 1930–68; *President*, 1952–59. *Secretary-Treasurer*, American Eugenics Society, 1959–70. *Author of Preface to Eugenics; coauthor of Dynamics of Population*.
BIOLOGICAL SCIENCES, THE (in part)
GENETICS AND HEREDITY, THE PRINCIPLES OF (in part)

F.H.S. Frank Harold Spedding (d. 1984). *Principal Scientist*, U.S. Atomic Energy Commission, Ames Laboratory, Iowa State University, Ames, 1968–74; *Director*, Ames Laboratory, 1947–68. *Coauthor of The Rare Earths*.
CHEMICAL ELEMENTS (in part)

F.H.Sh. Frank H. Shu. *Professor of Astronomy*, University of California, Berkeley. *Author of The Physical Universe*.
COSMOS, THE

F.Hu. Frederick Fu Hung (deceased). *Emeritus Professor of Geography*, University of Guelph, Ontario. *Author of a geography series for schools (in Chinese) and others*.
CHINA (in part)

F.H.W. Fred H. Wilt. *Professor of Cell and Developmental Biology*, University of California, Berkeley. *Editor of Methods in Developmental Biology*.
GROWTH AND DEVELOPMENT, BIOLOGICAL (in part)

F.İ. Fahir İz. *Professor of Turkish Literature*, Boğaziçi University, Istanbul. *Author of Ottoman Turkish Prose; Ottoman Turkish Verse; and others*.
CENTRAL ASIAN ARTS (in part)

F.J.A. Francisco Jose Ayala. *Donald Bren Professor of Biological Sciences*, University of California, Irvine. *Author of Evolving: The Theory and Processes of Organic Evolution and others*.
EVOLUTION, THE THEORY OF

F.J.B. Fred J. Benson (d. 1996). *Professor of Civil Engineering*, 1947–80; *Dean*, College of Engineering, Texas A&M University, College Station, 1957–78.
PUBLIC WORKS (in part)

F.J.B.W. Sir F.J.B. Watson (d. 1992). *Director of the Wallace Collection*, London, 1963–74. *Surveyor of the Queen's Works of Art*, 1963–72. *Author of Fragonard; Canaletto; and others*.
FRAGONARD, JEAN-HONORÉ (Micropædia)

F.J.D. Frederick J. Dockstader. *Museum consultant and art historian. Director*, Museum of the American Indian, Heye Foundation, New York City, 1960–75. *Author of Indian Art in North America; Indian Art in South America; and others*.
AMERICAN PEOPLES, ARTS OF NATIVE (in part)

F.J.E.R. Frederic James Edward Raby (d. 1966). *Fellow and Lecturer*, Jesus College, University of Cambridge, 1948–54. *Author of A History of Christian Latin Poetry and others*.
LATIN LITERATURE (in part)

F.J.G.E. F. John G. Ebling (d. 1992). *Professor of Zoology*, 1968–82; *Independent Research Worker in Dermatology*, University of Sheffield, England. *Coeditor of and contributor to Textbook of Dermatology*.
INTEGUMENTARY SYSTEMS (in part)

F.J.M. Francis J. Murray. *Emeritus Professor of Mathematics*, Duke University, Durham, North Carolina. *Author of Mathematical Machines*.
ARITHMETIC (in part)

F.J.Ma. Frank J. Malina (d. 1981). *Trustee*, International Academy of Astronautics, Paris, 1963–81; *President*, 1963. *Founder-Editor*, Leonardo (international journal of the contemporary artist). *Editor of the first-fifth Lunar International Laboratory Symposia*.
KÁRMÁN, THEODORE VON (Micropædia)

F.J.S. Frederick J. Streng (d. 1993). *Professor of the History of Religions, Southern Methodist University, Dallas, Texas, 1974–93. Author of Emptiness: A Study of Religious Meaning; Understanding Religious Life.*
NĀGĀRJUNA (Micropædia)
RITES AND CEREMONIES, SACRED (in part)

F.-J.Se. Franz-Josef Schmale. *Professor of Medieval History, University of the Ruhr, Bochum, Germany. Editor of Quellen zur Geschichte Kaiser Heinrichs IV.*
HENRY IV (GERMANY/HOLY ROMAN EMPIRE) (Micropædia)
HENRY V (GERMANY/HOLY ROMAN EMPIRE) (Micropædia)

F.J.W. Francis James West. *Emeritus Professor of History and Government, Deakin University, Geelong, Australia. Author of Political Advancement in the South Pacific and others.*
PACIFIC ISLANDS (in part)

F.K. The Most Rev. Franz Cardinal König. *Archbishop of Vienna, 1956–85. Author of Zarathustras Jenseitsvorstellungen und das Alte Testament and others.*
ZOROASTER (Micropædia)

F.K.A. Franklin K. Anderson. *Senior Scientist, EG & G Idaho, Inc., Idaho Falls. Associate Editor, Life Sciences (Botany), Encyclopædia Britannica, Chicago, 1970–72. Coauthor of Plant Stress from Air Pollution.*
ANGIOSPERMS (in part)

F.K.H. F. Kenneth Hare. *Chancellor, Trent University, Peterborough, Ontario. University Professor Emeritus of Geography, University of Toronto. An authority on world climate and its relation to other environmental conditions. Author of The Restless Atmosphere.*
CLIMATE AND WEATHER (in part)

F.K.L. Fang Kuei Li (d. 1987). *Professor of Chinese Linguistics and Anthropology, University of Washington, Seattle, 1959–69. Professor of Asian Linguistics, University of Hawaii, Honolulu, 1969–73. Authority on the languages of South China. Author of The Tai Dialect of Lungchow.*
LANGUAGES OF THE WORLD (in part)

F.La. François Lasserre (d. 1989). *Professor of Classical Greek, University of Lausanne, Switzerland. Translator and editor of Strabon, Géographie (books 3–6, 10–12).*
STRABO (Micropædia)

F.L.S. Frederick L. Schwab. *Professor of Geology, Washington and Lee University, Lexington, Virginia. Editor of Geosynclines: Concept and Place Within Plate Tectonics.*
MINERALS AND ROCKS

F.M. Fosco Maraini. *Writer. Former Lecturer in Japanese, University of Florence. Author of Where Four Worlds Meet and others.*
ASIA (in part)
POLO, MARCO (Micropædia)

F.M.B. Fawn McKay Brodie (d. 1981). *Professor of History, University of California, Los Angeles, 1971–77. Author*

of The Devil Drives: A Life of Sir Richard Burton.
BURTON, SIR RICHARD (Micropædia)

F.M.Ba. František M. Bartoš (d. 1972). *Professor of Church History, Comenius Protestant Theological Faculty, Prague.*
HUS, JAN (in part) (Micropædia)

F.McD. Forrest McDonald. *Distinguished Research Professor of History, University of Alabama, Tuscaloosa. Author of The American Presidency: An Intellectual History; Novus Ordo Seclorum: The Intellectual Origins of the Constitution.*
UNITED STATES PRESIDENCY AND FIRST LADY (in part)

F.M.Kg. Felix M. Keesing (d. 1961). *Professor of Anthropology, Stanford University, California, 1942–61. Author of Cultural Anthropology and others.*
PREHISTORIC PEOPLES AND CULTURES (in part)

F.Mo. Francis Moran (d. 1975). *Golf writer, The Scotsman, Edinburgh. President, Association of Golf Writers. Author of Golfers' Gallery.*
SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

F.M.S. Frank M. Shipman (deceased). *Member, Board of Directors, Brown-Forman Distillers Corporation, Louisville, Kentucky, 1951–70; Technical Director, 1940–65; Vice President, 1945–65.*
BEVERAGE PRODUCTION (in part)

F.M.V. Florence M. Voegelin (d. 1989). *Editor, Anthropological Linguistics, Indiana University, Bloomington; Director, Archives of Languages of the World. Coauthor of Classification and Index of the World's Languages and others.*
LANGUAGES OF THE WORLD (in part)

F.N. Fritz Neumark (d. 1991). *Professor of Political Economy, Johann Wolfgang Goethe University of Frankfurt, Frankfurt am Main, Germany. Author of Grundsätze gerechter und ökonomisch rationaler Steuerpolitik.*
TAXATION (in part)

F.N.D. Frank N. Dauster. *Emeritus Professor of Spanish, Rutgers University, New Brunswick, New Jersey. Author of Historia del teatro hispanoamericano and others.*
LATIN-AMERICAN LITERATURE (in part)

F.N.H.R. Frank Neville H. Robinson (d. 1996). *Senior Research Officer, Clarendon Laboratory, University of Oxford; Fellow, St. Catherine's College, Oxford, 1962–92. Author of Noise and Fluctuations in Electronic Devices and Circuits and others.*
ELFCTRICITY AND MAGNETISM (in part)

F.N.S. Fyodor Nikolayevich Sukhopara. *Former Head of Section, Scientific Council on the Location of the U.S.S.R. Productive Forces, Academy of Sciences of the U.S.S.R., Moscow. Coauthor of Development of Large Economic Regions of the U.S.S.R.*
BALKAN STATES (in part)

F.N.W. Fred N. White. *Emeritus Professor of Physiology, University of*

California, San Diego, at La Jolla; former Director, Physiological Research Laboratory, Scripps Institution of Oceanography. Coauthor of Animal Function: Principles and Adaptations.
RESPIRATION AND RESPIRATORY SYSTEMS (in part)

F.O. Frédéric Ogé. *Research staff member, National Centre for Scientific Research, France.*
EUROPE (in part)

F.Om. Farouk Omar. *Professor of History, College of Arts, University of Baghdad, Iraq. Author of History of the Early 'Abbasids.*
BARMAKIDS (Micropædia)

F.O.Wa. Frederick O. Waage (d. 1985). *Professor of the History of Art and Archaeology, Cornell University, Ithaca, New York, 1945–71. Author of Prehistoric Art and others.*
DECORATIVE ARTS AND FURNISHINGS (in part)

F.P.B. Frederick P. Bargebuhr (d. 1978). *Professor of Religion, University of Iowa, Iowa City, 1962–70. Author of The Alhambra: A Cycle of Studies on the Eleventh Century in Moorish Spain.*
IBN GABIROL (Micropædia)

F.P.K. Frank P. Kolb. *Professor of Ancient History, Eberhard Karl University of Tübingen, Germany. Author of Die Stadt im Altertum and others.*
CARACALLA (Micropædia)

F.P.L. Fritz P. Loewe (d. 1974). *Senior Lecturer in Charge, Department of Meteorology, University of Melbourne, Australia, 1938–61. World authority on the meteorology of the Southern Hemisphere. Author of Études de glaciologie en Terre Adélie.*
CLIMATE AND WEATHER (in part)

F.Po. Frederik Pohl. *Author of Tiberius (under the pseudonym Ernst Mason) and of many works of science fiction.*
TIBERIUS (in part) (Micropædia)

F.R. Fazlur Rahman (d. 1988). *Professor of Islāmīc Philosophy, University of Chicago, 1969–88. Author of Islam and others.*
ISLĀM, MUHAMMAD AND THE RELIGION OF (in part)

F.R.A. Francis R. Aumann (d. 1995). *Professor of Political Science, Ohio State University, Columbus, 1940–71. Coauthor of The Government and Administration of Ohio.*
UNITED STATES OF AMERICA (in part)

F.R.Al. Frank Raymond Allchin. *Emeritus Reader in Indian Studies, University of Cambridge. Coauthor of The Rise of Civilization in India and Pakistan.*
AFGHANISTAN (in part)
INDIA (in part)

Fr.H. Sir Frank Hartley (d. 1997). *Chairman, British Pharmacopoeia Commission, 1970–80. Vice-Chancellor, University of London, 1976–78; Dean, School of Pharmacy, 1962–76.*
MEDICINE (in part)

Fr.L. Fred Landis. *Professor of Mechanical Engineering, University of Wisconsin, Milwaukee; Dean, College of Engineering and Applied Science, 1974–83.*
ENERGY CONVERSION (in part)

F.R.M. Frank R. Moraes (d. 1974). *Editor in Chief, The Indian Express, New Delhi, 1957–72. Author of India Today; Jawaharlal Nehru: A Biography.*
NEHRU, JAWAHARLAL (in part)
(Micropædia)

F.Ro. Ferdinand Rodriguez. *Professor of Chemical Engineering, Cornell University, Ithaca, New York. Author of Principles of Polymer Systems.*
INDUSTRIAL POLYMERS (in part)

Fr.R. Franklin Rosemont. *Writer and editor. Editor of Arsenal: Surrealist Subversion and others.*
SOCIO-ECONOMIC DOCTRINES AND REFORM MOVEMENTS, MODERN (in part)

F.R.S. F. Richard Stephenson. *Senior Research Fellow in Physics, University of Durham, England. Coauthor of Atlas of Historical Eclipse Maps: East Asia.*
ECLIPSE, OCCULTATION AND TRANSIT (in part)

F.S. Franklin Sherman. *Director, Institute for Jewish–Christian Understanding, Muhlenberg College, Allentown, Pennsylvania. Coauthor of The Place of Bonhoeffer.*
BONHOEFFER, DIETRICH (Micropædia)

F.Sc. Friedrich Schreyvogel (d. 1976). *Novelist and freelance writer. Vice-Director, Vienna Burgtheater, 1954–59. Author of Ein Jahrhundert zu früh: das Schicksal Josephs II and others.*
JOSEPH II (GERMANY/HOLY ROMAN EMPIRE)
(Micropædia)

F.So. Friedrich Solmsen (d. 1989). *Moses Slaughter Professor of Classical Studies, University of Wisconsin, Madison, 1962–74. Author of Hesiod and Aeschylus.*
HESIOD (Micropædia)

F.S.P. Francis S. Pierce. *Former Editor, Congressional Budget Office, Washington, D.C. Associate Editor, Economics, Encyclopædia Britannica, Chicago, 1967–73.*
INTERNATIONAL TRADE (in part)
VEBLEN, THORSTEIN (Micropædia)

F.T. Frederick Tepper. *General Manager, Instrument Division, Mine Safety Appliances Company, Pittsburgh. Coauthor of Alkali Metal Handling and System Operating Techniques.*
CHEMICAL ELEMENTS (in part)

F.Th. Friedrich Thöne (deceased). *Art historian. Author of Lucas Cranach der Ältere and others; coauthor of Thieme-Becker: Künstler-Lexikon.*
CRANACH, LUCAS, THE ELDER (in part)
(Micropædia)

F.T.M. Fred T. Mackenzie. *Professor of Oceanography and of Geology and Geophysics, University of Hawaii at Manoa, Honolulu. Coauthor of Our Changing Planet and others.*
HYDROSPHERE, THE
OCEANS (in part)

F.Tr. François Treves. *Professor of Mathematics, Rutgers University, New Brunswick, New Jersey. Author of Topological Vector Spaces, Distributions and Kernels; Basic Linear Partial Differential Equations.*
ANALYSIS (IN MATHEMATICS) (in part)

Fu.M. Fujimura Michio. *Professor of History, Sophia University, Tokyo. Author of Yamagata Aritomo and others.*
YAMAGATA ARITOMO, KOSHAKU
(Micropædia)

F.V.O'C. Francis Valentine O'Connor. *Independent art historian. Coeditor of Jackson Pollock: A Catalogue Raisonné of Paintings, Drawings, and Other Works. Author of Federal Support for the Visual Arts: The New Deal and Now and others.*
POLLOCK, JACKSON

F.V.Sn. Fernand Van Steenberghen. *Emeritus Professor of Medieval Philosophy, Catholic University of Louvain, Belgium.*
PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (in part)

F.W.C. Francis William Carter. *Lecturer in the Geography of Eastern Europe and Chairman, Department of Social Sciences, School of Slavonic and East European Studies, University of London. Editor of An Historical Geography of the Balkans.*
BALKAN STATES (in part)
CZECH AND SLOVAK REPUBLICS (in part)
PRAGUE (in part)

F.W.G. Frederick William Gibbs (d. 1966). *Deputy Secretary and Editor, Royal Institute of Chemistry, London.*
DAVY, SIR HUMPHRY, BARONET
(Micropædia)

F.Wh. Frederick Whitehead (d. 1971). *Reader in Old French Language and Literature, Victoria University of Manchester, England. Editor of La Chanson de Roland; La Chastelaine de Vergi.*
LITERATURE, THE ART OF (in part)

F.Wi. Frank Willett. *Honorary Senior Research Fellow, Hunterian Museum and Art Gallery, University of Glasgow, Scotland; Director and Titular Professor, 1976–90. Author of African Art; Ife in the History of West African Sculpture.*
AFRICAN ARTS (in part)

F.W.Kn. Franklin W. Knight. *Director, Latin-American Studies Program, Stulman Professor of History, Johns Hopkins University, Baltimore, Maryland. Author of Slave Society in Cuba during the Nineteenth Century and others.*
WEST INDIES, THE (in part)

F.W.W. Frank W. Walbank. *Rathbone Professor Emeritus of Ancient History and Classical Archaeology, University of Liverpool. Author of A Historical Commentary on Polybius and others.*
ALEXANDER THE GREAT (in part)
PLUTARCH (in part) (Micropædia)
POLYBIUS (Micropædia)

F.W.W.-S. Francis William Wentworth-Sheilds (d. 1969). *Artist. Principal Lecturer, Department of Printing and Graphic Design, Twickenham College of Technology, England, 1966–69.*

PAINTING, THE HISTORY OF WESTERN
(in part)

F.X.H. The Rev. Francis X. Hezel, S.J. *Director, Micronesian Seminar, Kolonia, Pohnpei, Federated States of Micronesia. Author of The First Taint of Civilization: A History of the Caroline and Marshall Islands in Pre-Colonial Days, 1521–1885.*
PACIFIC ISLANDS (in part)

F.X.M. The Rev. Francis Xavier Murphy, C.S.S.R. *Emeritus Professor of Patristic Moral Theology, Academia Alfonsiana, Rome. Staff editor for Patrology, New Catholic Encyclopedia.*
ALEXANDER VI (PAPACY) (Micropædia)
PAUL III (PAPACY) (Micropædia)

F.Z. Frank Zuccari. *Executive Director of Conservation, Art Institute of Chicago.*
ART CONSERVATION AND RESTORATION
(in part)

G.A. Giovanni Aquilecchia. *Emeritus Professor of Italian, University College, University of London. Author of Giordano Bruno and others.*
ARIOSTO, LUDOVICO (Micropædia)
BRUNO, GIORDANO (Micropædia)
ITALIAN LITERATURE (in part)
TASSO, TORQUATO (in part) (Micropædia)

G.A.B. Georg A. Borgstrom (d. 1990). *Professor of Food Science, 1956–81, and of Geography, 1960–81, Michigan State University, East Lansing. Editor of Fish as Food.*
FISHING, COMMERCIAL (in part)

G.A.C.H. Geoffrey A.C. Herklots (d. 1986). *Colombo Plan Botanical Adviser to Government of Nepal, 1961–63. Principal and Director of Research, Imperial College of Tropical Agriculture, Trinidad, 1953–60. Author of Vegetables in South-East Asia and others.*
GARDENING AND HORTICULTURE (in part)

G.A.F.K. George Angus Fulton Knight. *President, Pacific Theological College, Suva, Fiji, 1965–72. Author of A Christian Theology of the Old Testament; Deutero-Isaiah, a Theological Commentary; and others.*
MACCABEES (in part) (Micropædia)

G.A.G.M. G.A.G. Mitchell (d. 1993). *Professor of Anatomy; Director, Anatomical Laboratories, Victoria University of Manchester, England, 1946–74. Author of The Anatomy of the Autonomic Nervous System and others.*

EXCRETION AND EXCRETORY SYSTEMS
(in part)

G.A.H. Geoffrey Alan Hosking. *Professor of Russian History, School of Slavonic and East European Studies, University of London. Author of Beyond Socialist Realism: Soviet Fiction Since Ivan Denisovich; A History of the Soviet Union, 1917–1991; and others.*
RUSSIA (in part)

Ga.J. Gary Jensen. *Professor of Sociology, Vanderbilt University, Nashville, Tennessee. Coauthor of Delinquency and Youth Crime; coeditor of Exploring Delinquency: Causes and Control.*
CRIME AND PUNISHMENT (in part)

G.Ak. **George Akita.** *Professor of History, University of Hawaii at Manoa, Honolulu. Author of Foundations of Constitutional Government.*

ITÔ HIROBUMI, KOSHAKU (Micropædia)

G.A.K. **Gregory A. Kimble.** *Emeritus Professor of Psychology, Duke University, Durham, North Carolina. Editor of Hilgard and Marquis' Conditioning and Learning.*

LEARNING AND COGNITION, HUMAN (in part)

G.A.L. **George Arthur Lindbeck.** *Pitkin Professor Emeritus of Historical Theology, Yale University. Author of The Nature of Doctrine: Religion and Theology in a Post-Liberal Age and others.*

rites and ceremonies, sacred (in part)

G.An. **George Anastaplo.** *Professor of Law, Loyola University, Chicago. Lecturer in the Liberal Arts, University of Chicago. Emeritus Professor of Political Science and of Philosophy, Rosary College, River Forest, Illinois. Author of The Constitutionalist and others.*

CENSORSHIP

G.A.O. **George A. Olah.** *Professor of Chemistry, University of Southern California, Los Angeles. Nobel Prize for Chemistry, 1994. Coeditor of Carbonium Ions.*

CARBONIUM ION (in part) (Micropædia)

Ga.P. **Gary William Poole.** *Associate Editor, Encyclopædia Britannica, Chicago, 1970–72.*

CHAMBERLAIN, JOSEPH (Micropædia)

JOSEPHUS, FLAVIUS (Micropædia)

G.A.P. **George A. Pettitt** (d. 1976). *Assistant to the President, University of California, Berkeley, 1936–66; Lecturer in Anthropology, 1940–66. Author of Prisoners of Culture.*

GESNER, CONRAD (Micropædia)

G.A.Po. **Gary A. Polis.** *Professor of Biology, Vanderbilt University, Nashville, Tennessee. Author of Biology of Scorpions and others.*

ARACHNIDS (in part)

Ga.S. **Gabriel Smith.** *Barrister-at-Law. Departmental Editor, Journal of Business Law.*

TAXATION (in part)

G.A.S. **George Albert Shepperson.** *William Robertson Professor Emeritus of Commonwealth and American History, University of Edinburgh. Author of David Livingstone and the Rovuma.*

LIVINGSTONE, DAVID (Micropædia)

G.A.Sa. **George A. Sacher** (d. 1981). *Senior Biologist, Division of Biological and Medical Research, Argonne National Laboratory, Argonne, Illinois, 1959–80. President, Gerontological Society, 1978–79. Coeditor of Aging and Levels of Biological Organization.*

GROWTH AND DEVELOPMENT, BIOLOGICAL (in part)

G.A.Sm. **George Alan Smith.** *Arts consultant. Hiker and mountain climber. Author of Introduction to Mountaineering.*

MOUNTAINEERING (in part) (Micropædia)

G.A.So. **G. Alan Solem** (d. 1990). *Curator of Invertebrates, Field Museum of Natural*

History, Chicago, 1959–90. Author of The Shell Makers and others.

MOLLUSKS (in part)

G.B. **Giovanni Bognetti.** *Professor of Public Law, University of Milan. Author of Costituzione economica e Corte costituzionale and others.*

CONSTITUTIONAL LAW (in part)

G.Ba. **George Barany.** *Emeritus Professor of History, University of Denver, Colorado. Author of Stephen Széchenyi and the Awakening of Hungarian Nationalism, 1791–1841.*

HUNGARY (in part)

G.B.Cl. **George B. Clark** (d. 1990). *Professor of Mining Engineering, Colorado School of Mines, Golden, 1976–84. Coauthor of Elements of Mining.*

INDUSTRIES, EXTRACTION AND PROCESSING (in part)

G.B.D. **George B. Dantzig.** *Professor of Operations Research and Computer Science, Stanford University, California. Author of Linear Programming and Extensions.*

OPTIMIZATION, THE MATHEMATICAL THEORY OF (in part)

G.Be. **George Benneh.** *Professor of Geography and Resource Development, University of Ghana, Legon.*

WESTERN AFRICA (in part)

G.Bh. **Geoffrey Barraclough** (d. 1984). *Chichele Professor of Modern History, University of Oxford, 1970–73. President, The Historical Association, 1964–67.*

HOLY ROMAN EMPIRE, THE HISTORY OF THE (in part)

G.Bi. **Garrett Birkhoff** (d. 1996). *George Putnam Professor of Pure and Applied Mathematics, Harvard University, 1969–81. Coauthor of Algebra.*

ALGEBRA (in part)

G.B.K. **George Briscoe Kerferd.** *Hulme Professor Emeritus of Greek, Victoria University of Manchester, England.*

PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (in part)

G.B.Ka. **George B. Kauffman.** *Professor of Chemistry, California State University, Fresno. Author of Inorganic Coordination Compounds and many others.*

CHEMICAL COMPOUNDS (in part)

INDUSTRIAL POLYMERS (in part)

G.Bl. **Georges Blond** (d. 1989). *Novelist and historian. Author of Pétain, 1856–1951.*

PÉTAINE, PHILIPPE (Micropædia)

G.B.L. **Gerhart B. Ladner** (deceased). *Emeritus Professor of History, University of California, Los Angeles, 1963–78. Author of Die Papstbildnisse des Altertums und des Mittelalters.*

BONIFACE VIII (PAPACY) (Micropædia)

INNOCENT III (Micropædia)

G.Br. **Günter Bräuer.** *Professor of Anthropology, University of Hamburg. Coeditor of Continuity or Replacement: Controversies in Homo sapiens Evolution.*

EVOLUTION, HUMAN (in part)

G.C. **Guido Calogero** (deceased). *Professor of Theoretical Philosophy,*

University of Rome. Author of Studi sull'eleatismo.

PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (in part)

G.Car. **Giovanni Carsaniga.** *Professor of Italian, University of Sydney, Australia.*

ITALIAN LITERATURE (in part)

G.C.B. **Gregorio C. Borlaza** (d. 1987). *Editorial Consultant, Philippine Christian University, Manila. Former President, Philippine Normal College.*

PHILIPPINES (in part)

G.C.Bo. **Geoffrey C. Bolton.** *Professor of History, Edith Cowan University, Mt. Lawley, Author of The Oxford History of Australia: Modern Australia, 1942–1986; general editor of The Oxford History of Australia.*

AUSTRALIA (in part)

G.C.C. **George C. Cromer.** *Former Manager, Administrative Services, General Motors Corporation, Warren, Michigan.*

TRANSPORTATION (in part)

G.C.E. **George C. Engerrand** (d. 1961). *Graduate Professor of Anthropology, University of Texas at Austin. Chief Geologist, Mexican Geological Survey, 1907–15.*

NORTH AMERICA (in part)

G.C.G. **George C. Gorman.** *Director, Tropical Programs, Center for Conservation Biology, Stanford University, California. Researcher on the evolution, behaviour, and systematics of lizards.*

REPTILES (in part)

G.C.H. **Gerald C. Hickey.** *Former Research Fellow, East-West Center, Honolulu. Research Anthropologist, RAND Corporation, Saigon, 1964–73. Author of Village in Vietnam and others.*

SOUTHEAST ASIA (in part)

G.C.H.III. **G. Cameron Hurst, III.** *Professor of History and of East Asian Languages and Cultures; Director, Center for East Asian Studies, University of Kansas, Lawrence. Author of Insei: Abdicated Sovereigns in the Politics of Late Heian Japan, 1086–1185 and many others.*

JAPAN (in part)

G.C.Ha. **Gladys Cox Hansen.** *City Archivist, San Francisco. Author of San Francisco Almanac; editor of San Francisco: The Bay and Its Cities.*

SAN FRANCISCO (in part)

G.C.H.B. **Göran C.H. Bauer, M.D.** (d. 1994). *Professor and Chairman, Department of Orthopedic Surgery, University of Lund, Sweden, 1969–89.*

SUPPORTIVE AND CONNECTIVE TISSUES (in part)

G.C.I. **George C. Izenour.** *Emeritus Professor of Theater Design and Technology, Yale University.*

THEATRICAL PRODUCTION (in part)

G.C.K. **George C. Kent, Jr.** *Alumni Professor Emeritus of Zoology, Louisiana State University, Baton Rouge. Author of Comparative Anatomy of the Vertebrates.*

REPRODUCTION AND REPRODUCTIVE SYSTEMS (in part)

G.C.L. Geoffrey Charles Last. *Former Adviser, Imperial Ethiopian Ministry of Education and Fine Arts, Addis Ababa.*
EASTERN AFRICA (in part)

G.C.L.B. G.C.L. Bertram. *Former Senior Tutor, St. John's College, University of Cambridge. Author of In Search of Mermaids: The Manatees of Guiana and others.*
MAMMALS (in part)

G.Cr. Gerhard Croll. *Emeritus Professor of Musicology, University of Salzburg, Austria. General editor of Christoph Willibald Gluck, Complete Edition of His Works.*
GLUCK, CHRISTOPH WILLIBALD (Micropædia)

G.C.R. George Clarence Robinson (d. 1976). *Professor of Political Science, University of Northern Iowa, Cedar Falls. Editor of Dictionary of Presidential Disapprovals.*
POLK, JAMES K. (Micropædia)

G.D.A. George D. Ashton. *Chief, Research Division, U.S. Army Cold Regions Research and Engineering Laboratory, U.S. Army Corps of Engineers, Hanover, New Hampshire. Author of River Ice and others.*
ICE AND ICE FORMATIONS (in part)

G.D.B. Georgy Dmitriyevich Bessarabov. *Head, Department of Agrarian Resources, Government Research Institute of Agrarian Resources, Moscow.*
ASIA (in part)

G.D.C. Gerson D. Cohen (d. 1991). *Chancellor, 1972–86; Jacob H. Schiff Professor of History, 1970–86, Jewish Theological Seminary of America, New York City. Editor and translator of Abraham ibn Daud's Sefer ha-Kabbala.*
JUDAISM (in part)

G.D.Cu. Glen D. Curry. *Professor of Criminology and Criminal Justice, University of Missouri at St. Louis. Coauthor of Confronting Gangs: Crime and Community.*
GRAFFITI (in part) (Micropædia)

G.De. George G. Dekker. *Professor of English, Stanford University, California. Author of James Fenimore Cooper: The Novelist and others.*
COOPER, JAMES FENIMORE (Micropædia)

G.Det. Georges Dethan. *Archivist, French Foreign Ministry Archives, Paris, 1947–88. Chief Editor, Revue d'Histoire Diplomatique. Author of Mazarin et ses amis and others.*
MAZARIN, JULES, CARDINAL (Micropædia)

G.D.G. George D. Garland. *Emeritus Professor of Physics, University of Toronto. Author of The Earth's Shape and Gravity and others.*
EARTH, THE (in part)

G.Di. Gérard Diffloth. *Professor of Linguistics and Asian Studies, Cornell University, Ithaca, New York.*
LANGUAGES OF THE WORLD (in part)

G. Di P. Giuseppe Di Palma. *Professor of Political Science, University of California, Berkeley. Author of Surviving Without*

Governing: The Italian Parties in Parliament and others.
ITALY (in part)

G.D.J. Gary Dean Johnson. *Professor of Geology, Dartmouth College, Hanover, New Hampshire.*
GEOCHRONOLOGY (in part)

G.D.L. Geoffrey D. Lewis. *Director of Museum Studies, University of Leicester, England, 1977–89. President, International Council of Museums, 1983–89. Author of For Instruction and Recreation: A Centenary History of the Museums Association and others.*
MUSEUMS

G.D.M. George Daniel Mostow. *Henry Ford II Professor of Mathematics, Yale University. Author of Strong Rigidity of Locally Symmetric Spaces.*
ALGEBRA (in part)
TOPOLOGY (in part)

G.D.Ma. Gerald D. Mahan. *Distinguished Professor of Physics, University of Tennessee, Knoxville. Distinguished Scientist, Solid State Division, Oak Ridge National Laboratory, Tennessee. Author of Many-Particle Physics.*
MATTER (in part)

G.D.P. George Duncan Painter. *Assistant Keeper in charge of incunabula, Department of Printed Books, British Library, London, 1954–74. Author of Proust: The Early Years; Proust: The Later Years; and others.*
PROUST, MARCEL (in part) (Micropædia)

G.D.W. G. Donald Whedon, M.D. *Medical research consultant. Director, National Institute of Arthritis, Metabolism, and Digestive Diseases, U.S. Department of Health and Human Services, Bethesda, Maryland, 1962–81.*
SUPPORTIVE AND CONNECTIVE TISSUES (in part)

G.Dy. George Dykhuizen (d. 1987). *James Marshall Professor of Philosophy, University of Vermont, Burlington, 1954–64. Author of The Life and Mind of John Dewey.*
DEWEY, JOHN (in part) (Micropædia)

G.E. Gordon Epperson. *Professor of Music, University of Arizona, Tucson. Author of The Musical Symbol: A Study of the Philosophic Theory of Music.*
MUSIC, THE ART OF (in part)

G.Ea. Gerald Early. *Merle Kling Professor of Modern Letters, Washington University, St. Louis, Missouri. Author of Tuxedo Junction: Essays on American Culture; The Culture of Bruising: Essays on Prizefighting, Literature, and American Culture.*
AFROCENTRISM (Micropædia)

G.E.A. Godfrey Edward Arnold, M.D. (d. 1989). *Professor and Director, Division of Otolaryngology, University of Mississippi Medical Center, Jackson, 1963–79. Coauthor of Voice, Speech, Language; Clinical Communicology.*
SPEECH (in part)

G.E.Al. Garland Edward Allen. *Professor of Biology, Washington University, St.*

Louis, Missouri. Author of Thomas Hunt Morgan: The Man and His Science.
MORGAN, THOMAS HUNT (in part) (Micropædia)

G.Ec. Garrett Eckbo. *Landscape architect and consultant in urban and environmental planning and design. Emeritus Professor of Landscape Architecture, University of California, Berkeley. Author of Landscape for Living and others.*
GARDEN AND LANDSCAPE DESIGN (in part)

Ge.Ca. George Cardona. *Professor of Linguistics, University of Pennsylvania, Philadelphia. Author of Studies in Indian Grammarians and others; coeditor of Indo-European and Indo-Europeans.*
LANGUAGES OF THE WORLD (in part)

G.E.D. Glyn Edmund Daniel (d. 1986). *Disney Professor of Archaeology, University of Cambridge, 1974–81; Fellow of St. John's College, Cambridge. Author of A Hundred and Fifty Years of Archaeology and others.*
HISTORY, THE STUDY OF (in part)
SCHLIEMANN, HEINRICH (Micropædia)

Ge.E. Brother George Every, S.S.M. (deceased). *Lecturer, Kelham Theological College, Newark, England. Author of The Byzantine Patriarchate, 451–1204 and others.*
PHOTIUS, SAINT (Micropædia)

G.E.F. George Edwin Fussell (d. 1990). *President, British Agricultural History Society. Author of The Farmer's Tools; Farming Technique from Prehistoric to Modern Times.*
AGRICULTURE, THE HISTORY OF (in part)

G.E.F.C. Guy Edward Farquhar Chilver (d. 1982). *Professor of Classical Studies, University of Kent at Canterbury, England, 1964–76. Author of "Vespasian" in Oxford Classical Dictionary.*
DOMITIAN (Micropædia)
VESPASIAN (Micropædia)

G.E.Fo. Gary Edward Forsythe. *Assistant Professor of Classical Languages and Literatures, University of Chicago. Author of The Historian L. Calpurnius Piso Frugi and the Roman Annalistic Tradition.*
GREEK AND ROMAN CIVILIZATIONS, ANCIENT (in part)

G.E.H. The Rev. G.E. Hughes (d. 1994). *Professor of Philosophy, Victoria University of Wellington, New Zealand, 1951–84. Coauthor of The Elements of Formal Logic and others.*
LOGIC, THE HISTORY AND KINDS OF (in part)

G.E.H.A. Gerald E.H. Abraham (d. 1988). *President, Royal Musical Association, 1970–74. Assistant Controller of Music, British Broadcasting Corporation, London, 1962–67. James and Constance Alsop Professor of Music, University of Liverpool, 1947–62. Author of A Hundred Years of Music and others.*
SCHUMANN, ROBERT (in part) (Micropædia)

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AFRICAN ARTS (in part)

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DECORATIVE ARTS AND FURNISHINGS
(in part)

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Ge.St. Gerald Strauss. *Distinguished Professor Emeritus of History, Indiana University, Bloomington. Author of Law, Resistance, and the State in Reformation Germany.*

GERMANY (in part)

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INDIAN OCEAN, THE (in part)

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BIRDS (in part)

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TRANSPORTATION (in part)

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ATOMS (in part)

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AGRICULTURAL SCIENCES (in part)

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ATOMS (in part)

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PRINTMAKING

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ASIA (in part)

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HUNGARIAN LITERATURE (in part)

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COMPUTER SCIENCE

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SOUTH AMERICA (in part)

G.G.H. Graham Goulder Hough (d. 1990). *Professor of English, University of Cambridge, 1966–75; Fellow of Darwin College, Cambridge, 1964–75. Author of The Romantic Poets and others.*

KEATS, JOHN (in part) (Micropædia)

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CLAY, HENRY (Micropædia)

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G.Ha. Georg Hazai. *Professor and Head, Department of Turkish Studies, University*

of Cyprus, Nicosia. Coeditor, Turkologischer Anzeiger/Turkology Annual. Author of Kurze Einführung in das Studium der türkischen Sprache and others.

LANGUAGES OF THE WORLD (in part)

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RIVERS (in part)

G.He. George Hendricks (d. 1979). *Professor of Social Sciences, Georgia Institute of Technology, Atlanta, 1962–69. Author of Union Army Occupation of the Southern Seaboard, 1861–1865.*

UNITED STATES OF AMERICA (in part)

G.Hi. Gilbert Highet (d. 1978). *Anthony Professor of Latin Language and Literature, Columbia University, 1950–72. Author of Juvenal the Satirist; The Classical Tradition.*

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COKE, SIR EDWARD (Micropædia)

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GERMANY (in part)

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SHINRAN (Micropædia)

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PRE-COLUMBIAN CIVILIZATIONS (in part)

G.H.T.K. George H.T. Kimble. *Director, Survey of Tropical Africa, Twentieth Century Fund, New York City, 1953–60. Professor of Geography, Indiana*

University, Bloomington, 1957–66. *Author of Tropical Africa* (2 vol.).

AFRICA (in part)

G.I.A. **Gordon I. Atwater** (d. 1973). *Founder and Senior Member, Atwater, Cowan, Carter, Miller, and Heffner (geological and petroleum consultants), New Orleans.*

FUELS, FOSSIL (in part)

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BRAZIL (in part)

URUGUAY (in part)

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WAR, THE TECHNOLOGY OF (in part)

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BAIKAL, LAKE (Micropædia)

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WATTEAU, ANTOINE (Micropædia)

Gi.T. **Giuseppe Tucci** (d. 1984). *Professor of Oriental Religion and Philosophy, University of Rome, 1933–65. Author of Il buddhismo and others.*

BUDDHISM, THE BUDDHA AND (in part)

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GENOCIDE (Micropædia)

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FISHES (in part)

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PETRIE, SIR FLINDERS (Micropædia)

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BERMUDA (in part) (Micropædia)

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ECONOMIC THEORY (in part)

G.J.Si. **Gustavus J. Simmons**. *Former Senior Fellow, National Security Studies, Sandia National Laboratories, Albuquerque, New Mexico; Manager, Applied Mathematics Department, 1971–87. Researcher in command and control of nuclear weapons. Author of numerous articles on cryptology and authentication.*

CRYPTOLOGY

G.J.T. **Gerald J. Toomer**. *Professor of the History of Mathematics, Brown University, Providence, Rhode Island. Author of Diocles on Burning Mirrors.*

ARCHIMEDES

G.J.W. **Gerald James Whitrow**. *Emeritus Professor of the History and Applications of Mathematics, Imperial College of Science and Technology, University of London. Author of The Natural Philosophy of Time and others.*

HAMILTON, SIR WILLIAM ROWAN

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LAPLACE, PIERRE-SIMON, MARQUIS DE

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OCCULTISM (in part)

RELIGIOUS AND SPIRITUAL BELIEF, SYSTEMS OF (in part)

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CASIMIR III (Micropædia)

CASIMIR IV (in part) (Micropædia)

JOHN III SOBIESKI (POLAND) (Micropædia)

WŁADYSŁAW II JAGIELLO (Micropædia)

G.L. **George Lang**. *Restaurateur. Contributor to Gourmet, Town & Country, and Travel Holiday magazines. Author of The Cuisine of Hungary.*

GASTRONOMY (in part)

RESTAURANT (in part) (Micropædia)

G.La. **Gil Latz**. *Professor of Geography, Portland State University, Oregon. Author of Agricultural Development in Japan: The Land Improvement District in Concept and Practice and others.*

JAPAN (in part)

G.L.C. **Gerhard L. Closs** (d. 1992). *A.A. Michelson Distinguished Service Professor of Chemistry, University of Chicago, 1974–92. Author of numerous papers on transient intermediates in chemical reactions.*

CARBANION (in part) (Micropædia)

CARBENE (Micropædia)

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ISOCRATES (Micropædia)

G.L.F. **Gary L. Fowler**. *Professor of Geography, University of Illinois, Chicago.*

NORTH AFRICA (in part)

G.Li. **Gillian Lindt**. *Professor of Religion, Columbia University. Author of Moravians in Two Worlds.*

ZINZENDORF, NIKOLAUS LUDWIG, GRAF VON

(Micropædia)

G.L.K. **Sir Geoffrey Langdon Keynes**, M.D. (d. 1982). *Honorary Librarian, Royal College of Surgeons of England. Consulting Surgeon, St. Bartholomew's Hospital, London. Author of The Life of William Harvey; A Bibliography of the Writings of Dr. William Harvey.*

HARVEY (in part)

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- Harvard University. Coauthor of Newark Foot Patrol Experiment. POLICE (in part)**
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- G.Ma. Golo Mann (d. 1994). Writer. Professor of History and Political Science, Technical University, Stuttgart, West Germany, 1960–64. Author of Friedrich von Gentz and others. GENTZ, FRIEDRICH (in part) (Micropædia)**
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- G.McC.McB. George McCutchen McBride (d. 1971). Professor of Geography, University of California, Los Angeles. Visiting Professor, Carnegie Endowment for International Peace, South America, 1929–30; Central America, 1938. Author of Agrarian Indian Communities of Highland Bolivia and others. BOLIVIA (in part)**
- G.M.Ce. Gerald M. Clemence (d. 1974). Professor of Astronomy, Yale University, 1966–74. Coauthor of Methods of Celestial Mechanics. NEWCOMB, SIMON (Micropædia)**
- G.McK.H. Graham McK. Hughes. Editor, Arts Review magazine. Former Art Director, Worshipful Company of Goldsmiths, London. Head of Design, Royal Mint, London. Author of Modern Silver. DECORATIVE ARTS AND FURNISHINGS (in part)**
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- G.Mn. Georges Mongrédien (d. 1980). Historian. Director of the Municipal Council of Paris and General Council of the Seine, 1947–67. Author of Le Grand Condé; Colbert; and many others. CONDÉ, LOUIS II DE BOURBON, 4^e PRINCE DE (Micropædia)**
- G.Mo. Gaston Monnerville (d. 1991). Member, Constitutional Council of France, 1974–83. President, Senate of France, 1958–68. Author of Clemenceau and others. CLEMENCEAU, GEORGES (in part) (Micropædia)**
- G.M.P. George M. Pigott. Professor and Director, Institute for Food Science and Technology, University of Washington, Seattle. Author of Production of Fish Oil and others. FOOD PROCESSING (in part)**
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- G.O. George Ordish (d. 1991). Editor, Tropical Science, London, 1966–72. Author of Untaken Harvest and others. AGRICULTURE, THE HISTORY OF (in part)**
- G.Ol. Gerrit Olivier. Professor of Afrikaans and Netherlandish, University of the Witwatersrand, Johannesburg, South Africa. Author of Ongerymdhede and others. SOUTH AFRICAN LITERATURE (in part) (Micropædia)**
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- G.Pan. Guido Pannain (d. 1977). Professor of the History of Music, S. Pietro a Maiella Conservatory of Music, Naples. Author of Lineamento di storia della musica and others. CORELLI, ARCANGELO (Micropædia)**
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- G.Pe. George Pendle (d. 1977). Managing Director, Pendle & Rivett Ltd., London. Author of A History of Latin America and others. URUGUAY (in part)**
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- G.P.Gi. Giovanni Pietro Giorgetti. Former Lecturer in Italian, Birkbeck College, University of London. ITALIAN LITERATURE (in part)**
- G.Pi. Sir George Pickering, M.D. (d. 1980). Master of Pembroke College, Oxford, 1968–74; Regius Professor of Medicine, University of Oxford, 1956–68. Author of High Blood Pressure. OSLER, SIR WILLIAM, BARONET (Micropædia)**
- G.P.J. Glenn Patrick Juday. Associate Professor of Forest Ecology; Alaska Ecological Reserves Coordinator, University of Alaska, Fairbanks. Author of The Locations, Composition, and Structure of Old-Growth Forests of the Oregon Coast Range and others. BIOSPHERE AND CONCEPTS OF ECOLOGY, THE (in part)**
- G.P.K. Gertrude Prokosch Kurath (d. 1992). Coordinator, Dance Research Center, Ann Arbor, Michigan. Author of Iroquois Music and Dance and others. AMERICAN PEOPLES, ARTS OF NATIVE (in part) FOLK ARTS (in part)**
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- G.P.Ma. The Rev. Germain P. Marc'hadour. Professor of Philology, Catholic University of the West, Angers, France. Director, Moreana Quarterly. Author of L'Univers de Thomas More and other works on Thomas More. MORE, SIR THOMAS (Micropædia)**
- G.P.R. Gerald P. Rodnan, M.D. (d. 1983). Professor of Medicine, University of**

Pittsburgh, 1967–83. *Editor of Primer on the Rheumatic Diseases.*

SUPPORTIVE AND CONNECTIVE TISSUES
(in part)

G.P.Ri. **G. Philip Rightmire.** *Professor of Anthropology, State University of New York at Binghamton.*

EVOLUTION, HUMAN (in part)

G.P.T. **Sir George Paget Thomson** (d. 1975). *Professor of Physics, University of London, 1930–52. Cowinner, Nobel Prize for Physics, 1937. Author of J.J. Thomson and the Cavendish Laboratory.*

THOMSON, SIR J.J. (Micropædia)

G.R. **Graham Reynolds.** *Keeper, Departments of Prints and Drawings, 1961–74, and of Paintings, 1959–74, Victoria and Albert Museum, London. Author of Constable, the Natural Painter.*

CONSTABLE, JOHN (Micropædia)

G.Ra. **Graham Ratcliff.**

Neuropsychologist, Harnarville Rehabilitation Center, Pittsburgh, Pennsylvania. Clinical Assistant Professor of Psychiatry, Neurology, and Psychology, University of Pittsburgh.

NERVES AND NERVOUS SYSTEMS (in part)

G.R.B. **Glenn Richard Bugh.** *Associate Professor of Ancient History, Virginia Polytechnic Institute and State University, Blacksburg. Author of The Horsemen of Athens.*

LEBANON (in part)

PALESTINE (in part)

G.R.C. **Gerald Roe Crone** (d. 1982) *Librarian and Map Curator, Royal Geographical Society, London, 1945–66. Author of Maps and Their Makers.*

HAKLUYT, RICHARD (Micropædia)

MACKINDER, SIR HALFORD JOHN

(Micropædia)

G.R.Co. **George R. Collins** (d. 1993). *Professor of Art History, Columbia University, 1962–86. Author of Antonio Gaudí and others; coauthor of The Designs and Drawings of Antonio Gaudí.*

GAUDÍ, ANTONI (Micropædia)

G.Re. **George S. Rentz.** *Emeritus Curator of the Middle East Collection, Hoover Institution on War, Revolution and Peace, Stanford, California. Emeritus Lecturer in Islāmic History, Stanford University. Coauthor and editor of Oman and the Southern Shore of the Persian Gulf.*

ARABIA (in part)

G.R.E. **Sir Geoffrey R. Elton** (d. 1994). *Regius Professor of Modern History, University of Cambridge, 1983–88; Fellow of Clare College, Cambridge, 1954–93. Author of The Tudor Revolution in Government and others.*

CRANMER, THOMAS (in part) (Micropædia)

CROMWELL, THOMAS, EARL OF ESSEX

(Micropædia)

HENRY VIII (ENGLAND) (in part)

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CENTRAL ASIA (in part)

G.R.H. **G.R. Hawting.** *Senior Lecturer in the History of the Near and Middle East,*

School of Oriental and African Studies, University of London.

MANŞÜR, AL- (Micropædia)

G.R.M.B. **Germain René Michel Bazin** (d. 1990). *Research Professor of Fine Arts, York University, Toronto, 1970–75. Chief Curator of Paintings and Drawings, Louvre Museum, Paris, 1951–65. Author of History of World Sculpture.*

RODIN, AUGUSTE (Micropædia)

G.Ro. **Gloria Robinson.** *Research Affiliate in the History of Medicine, Yale University.*

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KÖPPEN, WLADIMIR (Micropædia)

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G.R.SI. **Gordon R. Slemon.** *Emeritus Professor of Electrical Engineering, University of Toronto. Coauthor of Electric Machines and others.*

ENERGY CONVERSION (in part)

G.R.T. **George Raynor Thompson** (d. 1994). *Historian, U.S. Army Strategic Communications Command, 1964–72.*

WAR, THE TECHNOLOGY OF (in part)

G.R.W. **Gordon R. Willey.** *Bowditch Professor Emeritus of Mexican and Central American Archaeology, Harvard University. Author of An Introduction to American Archaeology.*

MEXICO (in part)

PRE-COLUMBIAN CIVILIZATIONS (in part)

G.R.We. **Gerald Raymond Webster.**

Associate Professor of Geography, University of Alabama, University. Assistant Professor of Geography, University of Wyoming, Laramie, 1985–89.

UNITED STATES OF AMERICA (in part)

Gr.W.K. **Gregory W. Knapp.** *Associate Professor of Geography, University of Texas at Austin. Author of Andean Ecology: Adaptive Dynamics in Ecuador; coauthor of South America.*

ECUADOR (in part)

SOUTH AMERICA (in part)

G.R.Z. **George R. Zug.** *Curator, Department of Vertebrate Zoology, National Museum of Natural History, Smithsonian Institution, Washington, D.C.*

BEHAVIOUR, ANIMAL (in part)

G.S. **Geoffrey Sawer.** *Emeritus Professor of Law, Australian National University, Canberra. Author of Law in Society.*

LAW, THE PROFESSION AND PRACTICE OF
(in part)

G.Sa. **Gudmund Sandvik.** *Professor of Legal History, University of Oslo, Norway,*

1975–95. Author of Det gamle veldet: Norske finansar 1760–79 and others.

DENMARK (in part)

NORWAY (in part)

SWEDEN (in part)

G.S.A. **Guy S. Alitto.** *Associate Professor of Modern Chinese History, University of Chicago. Author of The Last Confucian.*

ASIA (in part)

G.Sch. **Schuller, Gunther.** *Jazz historian, composer, and musicologist. Author of The Compleat Conductor; The Swing Era; The History of Jazz; and others. Composer of Sonata for Alto Saxophone and Piano; The Black Warrior oratorio; and others.*

MUSICAL FORMS AND GENRES (in part)

G.S.E. **Gary S. Elbow.** *Professor of Geography; Director of Latin American Area Studies, Texas Tech University, Lubbock. Contributor to Middle America: Its Lands and Peoples (3rd ed.).*

CENTRAL AMERICA (in part)

G.Sh. **Gordon Shillinglaw.** *Emeritus Professor of Accounting, Columbia University. Author of Financial Accounting Concepts and Applications and others.*

ACCOUNTING

G.S.H. **Gerald S. Hawkins.** *Astronomer, Smithsonian Astrophysical Observatory, Cambridge, Massachusetts, 1962–74. Author of Mindsteps to the Cosmos and others.*

BRADLEY, JAMES (Micropædia)

G.S.Ha. **Gordon S. Haight** (d. 1985). *Professor of English, Yale University 1950–68. Author of George Eliot: A Biography; editor of The George Eliot Letters.*

ELIOT, GEORGE (Micropædia)

G.S.Hu. **George Samuel Hurst.** *Professor of Physics, University of Tennessee, Knoxville. Coauthor of Principles and Applications of Resonance Ionisation Spectroscopy.*

ANALYSIS AND MEASUREMENT, PHYSICAL AND
CHEMICAL (in part)

G.Si. **George Bertrand Silberbauer.** *Senior Lecturer in Anthropology and Sociology, Monash University, Clayton, Australia. Author of Hunter and Habitat in the Central Kalahari Desert and others.*

AFRICA (in part)

G.S.K. **Geoffrey S. Kirk.** *Regius Professor Emeritus of Greek, University of Cambridge. Author of The Songs of Homer and others.*

HOMERIC EPICS, THE

G.S.Ke. **G. Stuart Keith.** *Research Associate, Department of Ornithology, American Museum of Natural History, New York City. Author of numerous scientific and popular articles on cranes.*

BIRDS (in part)

G.S.L. **George S. Lane** (d. 1981). *Kenan Professor of Germanic and Comparative Linguistics, University of North Carolina at Chapel Hill, 1950–72. Author of Studies in Kucheian Grammar I.*

LANGUAGES OF THE WORLD (in part)

G.S.Lo. George S. Losey. *Professor of Zoology, University of Hawaii at Manoa, Honolulu.*

COLORATION, BIOLOGICAL (in part)

G.S.M. Gary Saul Morson. *Frances Hooper Professor of the Arts and Humanities; Professor of Slavic Languages, Northwestern University, Evanston, Illinois. Author of Hidden in Plain View: Narrative and Creative Potentials in "War and Peace" and others.*

DOSTOYEVSKY

RUSSIAN LITERATURE (in part)

TOLSTOY

G.S.P.F.-G. Greville Stewart Parker Freeman-Grenville. *Honorary Fellow, University of York, Heslington, England. Professor of African History, State University of New York College at New Paltz, 1969-74. Author of The Medieval History of the Coast of Tanganyika and others.*

SA'ID IBN SULTAN (Micropædia)

G.St. George Speaight. *Former Editorial Director, George Rainbird Ltd. Author of The History of the English Puppet Theatre; Punch and Judy: A History; and others.*

PUPPETRY

G.T.G. Guy Thompson Griffith (d. 1985). *Laurence Reader in Classics, University of Cambridge, 1951-75; Fellow of Gonville and Caius College, Cambridge. Coauthor of A History of Macedonia.*

PHILIP II (MACEDONIA) (Micropædia)

G.Ts. George Thomas Tsoumis. *Emeritus Professor of Forest Utilization, Aristotelian University of Thessaloniki, Greece. Author of Science and Technology of Wood and others.*

FORESTRY AND WOOD PRODUCTION (in part)

G.T.S. Glenn T. Seaborg (d. 1999). *University Professor of Chemistry; Associate Director-at-Large, Lawrence Berkeley Laboratory, University of California, Berkeley; Chancellor, 1958-61. Chairman, Atomic Energy Commission, 1961-71. Cowinner, Nobel Prize for Chemistry, 1951. Author of Man-Made Transuranium Elements.*

CHEMICAL ELEMENTS (in part)

G.T.Se. Giles Timothy Severin. *Freelance writer. Author of Explorers of the Mississippi.*

NORTH AMERICA (in part)

G.Tu. Glenn Tucker (d. 1976). *Freelance writer and historian. Author of Tecumseh: Vision of Glory.*

TECUMSEH (Micropædia)

G.U. George Unwin (d. 1994). *Reader, Editor, and Translator, George Allen & Unwin Ltd., London. Translator of Sign, Symbol and Script and others.*

PUBLISHING (in part)

Gu.A. Gustavo Anguizola. *Research Professor of History, University of Texas at Arlington. Author of One Hundred Years of Isthmian Political Instability and others.*

CENTRAL AMERICA (in part)

Gu.K. Gunnar Karlsson. *Professor of History, University of Iceland, Reykjavik. Author of Sjálfstæði íslendinga.*

ICELAND (in part)

Gu.S. Gunnar Schlieder. *Former Instructor in Geology, Lehigh University, Bethlehem, Pennsylvania.*

CONTINENTAL LANDFORMS (in part)

Gu.W. Gunther Wolf. *Former Professor of History, University of Stuttgart, Germany. Coauthor and editor of Stupor Mundi: Zur Geschichte Friedrichs II von Hohenstaufen.*

FREDERICK II (GERMANY/HOLY ROMAN EMPIRE) (Micropædia)

G.V. Georges Vajda (d. 1981). *Director of Studies, École pratique des Hautes études (Institute for Advanced Research), Paris. Author of Recherches sur la philosophie et la Kabbale dans la pensée juive du Moyen-Âge and others.*

JUDAISM (in part)

G.V.M. Gerard V. Middleton. *Professor of Geology, McMaster University, Hamilton, Ontario. A leading advocate of quantitative methods in studies of sediments.*

OCEANS (in part)

G.V.T.M. Geoffrey Vernon Townsend Matthews. *Director of Research and Conservation, The Wildfowl and Wetlands Trust, Slimbridge, England, 1955-88. Author of Bird Navigation.*

BIRDS (in part)

G.W. George Woodcock (d. 1995). *Editor, Canadian Literature (quarterly), University of British Columbia, Vancouver, 1959-77. Author of Anarchism; The Crystal Spirit: A Study of George Orwell; Pierre-Joseph Proudhon.*

ORWELL, GEORGE (Micropædia)

PROUDHON, PIERRE-JOSEPH (Micropædia)
SOCIO-ECONOMIC DOCTRINES AND REFORM MOVEMENTS, MODERN (in part)

G.Wa. Gray Watson. *Senior Lecturer in History of Art, Wimbledon School of Art, London.*

MUNCH, EDVARD (Micropædia)

G.W.A. Gösta W. Ahlström (d. 1992). *Professor of Old Testament and Ancient Palestinian Studies, University of Chicago, 1976-88. Author of Aspects of Syncretism in the Israelite Religion.*

DOCTRINES AND DOGMAS, RELIGIOUS (in part)

G.W.Al. Gay Wilson Allen (d. 1995). *Professor of English, New York University, 1946-69. Author of The Solitary Singer: A Critical Biography of Walt Whitman and others.*

WHITMAN, WALT (in part) (Micropædia)

G.W.B. Geoffrey W. Bromiley. *Emeritus Professor of Church History and Historical Theology, Fuller Theological Seminary, Pasadena, California. Editor and translator of Zwingli and Bullinger (Library of Christian Classics).*

ZWINGLI, HULDRYCH (Micropædia)

G.W.Ba. Glen W. Baxter. *Senior Lecturer on East Asian Studies, Harvard University, 1956-80; Associate Director, Harvard-Yenching Institute, 1964-80. Author of Index to the Imperial Register of Tz'u Prosody.*

PAN KU (Micropædia)

G.W.Bo. G.W. Bowersock. *Professor of Ancient History, Institute for Advanced Study, Princeton University. Author of Greek Sophists in the Roman Empire and others.*

AGRIPPA, MARCUS VIPSANIUS (Micropædia)
HADRIAN (in part) (Micropædia)

G.W.F. Glenn W. Froning. *Professor of Food Science and Technology, University of Nebraska, Lincoln. Author of Effect of Season and Age of Layer on Egg Quality.*

FOOD PROCESSING (in part)

G.W.G. Gary William Gibbons. *Reader in Theoretical Physics, University of Cambridge. Coeditor of The Formation and Evolution of Cosmic Strings and others.*

MECHANICS (in part)

G.W.H. Gerard Willem Huygens. *Professor of History and Dutch Literature, Rotterdam Lyceum, The Netherlands. Author of The Dutch Writer and His Public.*

DUTCH LITERATURE (in part)

G.Win. Gustaf Wingren. *Emeritus Professor of Systematic Theology, University of Lund, Sweden. Author of Man and the Incarnation: A Study in the Biblical Theology of Irenaeus and others.*

IRENÆUS, SAINT (Micropædia)

G.W.Kn. George W. Knepper. *Distinguished Professor Emeritus of History, University of Akron, Ohio. Author of An Ohio Portrait and others.*

UNITED STATES OF AMERICA (in part)

G.W.P. Giles William Playfair (d. 1996). *Freelance writer. Professor of Drama, Williams College, Williamstown, Massachusetts, 1956-63. Author of Kean and others.*

KEAN, EDMUND (in part) (Micropædia)

G.Wr. Gordon Wright. *William H. Bonsall Professor Emeritus of History, Stanford University, California. Author of France in Modern Times and others.*

FRANCE (in part)

G.W.R. Gar W. Rothwell. *Professor of Environmental and Plant Biology, Ohio University, Athens.*

PLANTS (in part)

G.W.S.B. Geoffrey Wallis Steuart Barrow. *Sir William Fraser Professor of Scottish History and Palaeography, University of Edinburgh. Author of Feudal Britain and others.*

RICHARD I (ENGLAND) (Micropædia)

G.W.We. George W. Wetherill. *Staff member, Department of Terrestrial Magnetism, Carnegie Institution of Washington, D.C.; former Director.*

SOLAR SYSTEM, THE (in part)

H.A. Henri Arvon. *Professor, University of Paris X. Author of Le Bouddhisme and others.*

FA-HSIEN (in part) (Micropædia)

Ha.A. Hans Aurenhammer. *Former Director, Austrian State Gallery, Vienna. Author of J.B. Fischer von Erlach and others.*

FISCHER VON ERLACH, JOHANN BERNHARD (in part) (Micropædia)

H.A.A. Hamza A. Alavi. Emeritus Reader in Sociology, Victoria University of Manchester. Author of numerous articles on Pakistan; coeditor of *Rural Development in Pakistan and others*.
PAKISTAN (in part)

H.A.B.R. Helen Anne B. Rivlin. Emerita Professor of History, State University of New York at Binghamton. Author of *The Agricultural Policy of Muḥammad 'Alī in Egypt and others*.
MUḤAMMAD 'ALĪ (EGYPT) (Micropædia)

Ha.D. Harry Davis. President, Systems Review Associates, Arlington, Virginia. Deputy Undersecretary of the Air Force (Systems Review), U.S. Department of Defense, Washington, D.C., 1968–73.
WAR, THE TECHNOLOGY OF (in part)

H.A.D. Harl Adams Dalstrom. Professor of History, University of Nebraska at Omaha. Author of *A.V. Sorensen and the New Omaha*.
UNITED STATES OF AMERICA (in part)

H.A.Da. Hugh Alistair Davies. Lecturer in English, University of Sussex, Brighton, England.
ENGLISH LITERATURE (in part)

Ha.G. Harvey S. Gross. Professor of Comparative Literature, State University of New York at Stony Brook. Author of *Sound and Form in Modern Poetry and others*.
LITERATURE, THE ART OF (in part)

H.A.G. Harry A. Gailey. Professor of History, San Jose State University, California. Author of *A History of The Gambia and others*.
WESTERN AFRICA (in part)

H.Ab. Hélène Ahrweiler. Chancellor, University of Paris, 1982–89; former Professor of the History of Byzantine Civilization, University of Paris I. Author of *Recherches sur l'administration de l'empire byzantin aux IX^e–XI^e siècles*.
NICEPHORUS II PHOCAS (Micropædia)

Ha.He. Hans Herzfeld (d. 1982). Professor of Modern History, Free University of Berlin, 1950–60. Author of *Die moderne Welt, 1789–1945*.
FREDERICK WILLIAM IV (PRUSSIA) (Micropædia)

Ha.K. Harold Kurtz (d. 1972). Author of *The Trial of Marshal Ney: His Last Years and Death and others*.
NEY, MICHEL, DUC D'ELCHINGEN (Micropædia)

Ha.Ko. Sir Hans Kornberg. Sir William Dunn Professor of Biochemistry, University of Cambridge; Master of Christ's College, Cambridge. Coauthor of *Energy Transformations in Living Matter*; editor of *Essays in Cell Metabolism*.
METABOLISM (in part)

Ha.M. Hans Moldenhauer. Musicologist. Director, Moldenhauer Archives. President, Spokane Conservatory of Music and Allied Arts, Inc., Washington. Author of *Anton von Webern: A Chronicle of His Life and Work and others*.
WEBERN, ANTON VON (Micropædia)

H.A.M. Henry A. Millon. Dean, Center for Advanced Study in the Visual Arts,

National Gallery of Art, Washington, D.C. Author of *Baroque and Rococo Architecture and others*.

ARCHITECTURE, THE HISTORY OF WESTERN (in part)

Ha.Ma. Harry Magdoff. Coeditor, Monthly Review. Author of *The Age of Imperialism and others*.

EUROPEAN OVERSEAS EXPLORATION AND EMPIRES, THE HISTORY OF (in part)

Ha.P. Hans H. Penner. Professor of Religion, Dartmouth College, Hanover, New Hampshire. Author of articles on structuralism, myth, and ritual.
RITES AND CEREMONIES, SACRED (in part)

H.Ar. Hassan Arfa. Major General, Iranian Army (retired). Author of *Under Five Shahs and others*.
REZA SHAH PAHLAVI (Micropædia)

Ha.Ro. Hans Roos (d. 1984). Professor of East European History, University of the Ruhr, Bochum, West Germany. Author of *A History of Modern Poland*.
POLAND (in part)

Ha.S. Hans Saner. Freelance writer. Personal Assistant to Professor Karl Jaspers, 1962–69. Author of *Karl Jaspers and others*.
JASPERS, KARL (Micropædia)

Ha.Sc. Harold Scarborough (d. 1988). Professor of Medicine; Provost, College of Medical Sciences, University of Maiduguri, Nigeria, 1979–84. Coauthor of *Textbook of Physiology and Biochemistry*.
MEDICINE (in part)

Ha.Si. Harvey Sicherman. President, Foreign Policy Research Institute, Philadelphia. Author of *Palestinian Self-Government (Autonomy): Its Past and Its Future*.
ISRAEL (in part)

H.A.Si. Herbert A. Simon. Richard King Mellon University Professor of Computer Science and Psychology, Carnegie Mellon University, Pittsburgh, Pennsylvania. Nobel Prize for Economics, 1978. Author of *The Sciences of The Artificial and many others*.
ARTIFICIAL INTELLIGENCE (Micropædia)

H.A.T. Henry Ashby Turner, Jr. Bass Professor of History, Yale University. Author of *The Two Germanies since 1945 and others*.
GERMANY (in part)

H.Au. Hermann Aubin (d. 1969). Professor of History, University of Hamburg, West Germany, 1946–54.
EUROPEAN HISTORY AND CULTURE (in part)

Ha.We. Hans Fritz Welzel (deceased). Professor of Penal Law and of the Philosophy of Law, Rhenish Friedrich Wilhelm University of Bonn, West Germany. Author of *Die Naturrechtslehre Samuel Pufendorfs*.
PUFENDORF, SAMUEL, FREIHERR VON (Micropædia)

H.B. Hans Bobek (d. 1990). Professor of Geography, University of Vienna. Author of *Iran: Probleme eines unterentwickelten Landes alter Kultur*.
ELBURZ MOUNTAINS (Micropædia)

H.B.A. Harry Burrows Acton (d. 1974). Professor of Moral Philosophy, University of Edinburgh, 1964–74.

CONDORCET, MARIE-JEAN-ANTOINE-NICOLAS DE CARITAT, MARQUIS DE (Micropædia)
SPENCER, HERBERT (Micropædia)

H.Bi. Haralds Biezais. Former Professor of the History of Comparative Religions, Swedish University of Åbo, Finland. Author of *Die himmlische Götterfamilie der alten Letten and others*.

EUROPEAN RELIGIONS, ANCIENT (in part)

H.B.K. Herbert B. Knechtel (d. 1987). President, Knechtel Laboratories, Inc. (consultants to the candy industry), Skokie, Illinois.
FOOD PROCESSING (in part)

H.B.-M. Hubert Beuve-Méry (d. 1989). Journalist. Founder of *Le Monde*. Author of *Le Suicide de la IV^e République*.
FRANCE (in part)

H.B.P. Henry Bamford Parkes (d. 1972). Professor of History, New York University, New York City, 1949–72. Author of *A History of Mexico*.
MEXICO (in part)

H.Br. Hugh Brogan. Professor of History, University of Essex, Colchester, England. Author of *Longman History of the United States of America*.

GOVERNMENT, THE FORMS OF

H.B.Ro. H.B. Rodgers. Professor of Geography, Victoria University of Manchester. Coauthor of *Lancashire, Cheshire and Isle of Man*.
MANCHESTER

H.C. The Rev. Henri Chambre, S.J. Professor, Institute of Social Studies, Catholic Institute of Paris, 1947–78. Associate Director of the Laboratory, College of France, Paris, 1968–73. Author of *De Karl Marx à Lénine et Mao Tsé-toung and others*.
MARXISM, MARX AND (in part)

H.Ca. Harold Carter. Emeritus Professor of Geography, University College of Wales, Aberystwyth, University of Wales. Coauthor of *The Towns of Wales*.
UNITED KINGDOM (in part)

H.C.B. Harold C. Bold (d. 1987). Professor of Systematic Botany, University of Texas at Austin, 1957–78. Author of *Morphology of Plants*.

REPRODUCTION AND REPRODUCTIVE SYSTEMS (in part)

H.C.C. H.C. Casey, Jr. Professor of Electrical Engineering, Duke University, Durham, North Carolina. Coauthor of *Heterostructure Lasers* (2 vol.).
ELECTRONICS (in part)

H.C.G. Howard C. Goldblatt. Professor of Chinese, University of Colorado, Boulder. Author of *Hsiao Hung*; editor of *Chinese Literature for the 1980s*.
CHINESE LITERATURE (in part)

H.Ch. Hoklam Chan. Professor of Chinese History, University of Washington, Seattle. Coeditor of and contributor to *Yüan Thought: Chinese Thought and Religion Under the Mongols*.
CHINA (in part)

H.Cha. **The Very Rev. Henry Chadwick.** *Regius Professor Emeritus of Divinity, University of Cambridge; Master of Peterhouse, Cambridge, 1987–93. Author of The Early Church and others.*

CHRISTIANITY (in part)

JOHN THE APOSTLE, SAINT (Micropædia)

ORIGEN (Micropædia)

H.C.R.L. **H.C. Robbins Landon.** *Freelance writer and music historian. Honorary Professorial Fellow, University of Wales College of Cardiff, 1971–79. Coeditor, Haydn Yearbook. Author of Haydn: A Documentary Study and others.*

HAYDN, JOSEPH (in part) (Micropædia)

H.D. **Hariprasanna Das.** *Former Professor of Geography, Gauhati University, Assam, India. Author of Geography of Assam.*

INDIA (in part)

H.Da. **Hugh Davson.** *Honorary Research Associate and Fellow, Department of Physiology, University College, University of London. Author of Physiology of the Eye; editor of The Eye.*

SENSORY RECEPTION (in part)

H.D.C. **Hugh D. Clout.** *Professor of Geography, University College London, University of London. Editor of The Times London History Atlas and many others.*

LONDON (in part)

H.D.F.K. **H.D.F. Kitto** (d. 1982). *Professor of Greek, University of Bristol, England, 1944–62. Author of Greek Tragedy; Form and Meaning in Drama.*

GREEK DRAMATISTS, THE CLASSICAL (in part)

H.-D.H.W. **Hans-Dietrich H. Weigmann.** *Vice President, Research, Textile Research Institute, Princeton, New Jersey.*

FARMING AND AGRICULTURAL TECHNOLOGY (in part)

H.Di. **Heide Dienst.** *Professor, Institute of Austrian History Research, University of Vienna. Author of Babenberger Studien and others.*

LEOPOLD I (GERMANY/HOLY ROMAN EMPIRE) (in part) (Micropædia)

H.D.I. **Hans Dietrich Irsmscher.** *Professor of Modern German Literary Criticism, University of Cologne, Germany. Author of Probleme der Herder-Forschung and others.*

HERDER, JOHANN GOTTFRIED VON (Micropædia)

H.D.L. **Hywel David Lewis.** (d. 1992). *Professor of History and Philosophy of Religion, King's College, University of London, 1955–77. Chairman of the Council of the Royal Institute of Philosophy, 1965–88. Author of Our Experience of God and others.*

RELIGIOUS AND SPIRITUAL BELIEF, SYSTEMS OF (in part)

H.D.S. **Helmut Dietmar Starke.** *Freelance writer on modern European history.*

GERMANY (in part)

LUXEMBURG, ROSA (Micropædia)

H.E. **Heinz Eulau.** *Emeritus Professor of Political Science, Stanford University, California. Author of The Politics of Representation and others.*

POLITICAL SYSTEMS (in part)

He.B. **Hellmut Brunner.** *Emeritus Professor of Egyptology, Eberhard Karl University of Tübingen, Germany. Author of An Outline of Middle Egyptian Grammar and others.*

WRITING (in part)

H.E.B. **Harry Elmer Barnes** (d. 1968). *Historian, sociologist, and writer. Author of A History of Historical Writing.*

COMTE, AUGUSTE (in part) (Micropædia)

He.Ba. **Hélène J. Balfet.** *Former staff member for comparative technology, Musée de l'Homme, Paris. Author of "Basketry: A Proposed Classification" in Papers on Californian Archaeology.*

DECORATIVE ARTS AND FURNISHINGS (in part)

H.E.C. **Henk E. Chin.** *Associate Professor of Economics, University of Amsterdam. Coauthor of Surinam: Politics, Economics and Society.*

SURINAME

He.F. **Herbert Friedmann** (d. 1987). *Director, Los Angeles County Museum of Natural History, 1961–70. Researcher on the evolution and ecology of brood parasites among birds. Author of The Honey-Guides; The Symbolic Goldfinch.*

BIRDS (in part)

He.Gu. **Henri Guillemin** (d. 1992). *Professor of History of French Literature, University of Geneva, 1963–73. Author of Lamartine, l'homme et l'oeuvre; Lamartine en 1848; and others.*

LAMARTINE, ALPHONSE DE (in part) (Micropædia)

He.H. **Heinz Heinen.** *Professor of Ancient History, University of Trier, Germany. Author of Untersuchungen zur hellenistischen Geschichte des 3. Jahrhunderts vor Chr. and others.*

PTOLEMY II PHILADELPHUS (Micropædia)

H.E.H. **Hans Egon Holthusen.** *Professor of German, Northwestern University, Evanston, Illinois, 1968–81. Author of A Portrait of Rilke.*

RILKE, RAINER MARIA (Micropædia)

H.E.Ht. **Harold Edwin Hurst** (d. 1978). *Hydrological Consultant, Ministry of Irrigation; Director General, Physical Department, Ministry of Public Works, Egypt, 1919–46. Author of The Nile.*

AFRICA (in part)

H.E.K. **Harry Edward Korab.** *Executive Director, Society of Soft Drink Technologists. Former Technical Director, National Soft Drink Association, Washington, D.C.*

BEVERAGE PRODUCTION (in part)

He.L. **Henry Liu.** *Professor of Civil Engineering; Director, Capsule Pipeline Research Center, University of Missouri, Columbia. Coeditor of Freight Pipelines.*

TRANSPORTATION (in part)

H.E.L.-H. **Hellmut E. Lehmann-Haupt** (d. 1992). *Professor of Bibliography; Rare*

Book Consultant, University of Missouri, Columbia, 1969–75. Author of Gutenberg and the Master of the Playing Cards.

GUTENBERG, JOHANNES (in part) (Micropædia)

H.E.M. **Harold E. Moore, Jr.** (d. 1980). *Professor of Botany, L.H. Bailey Hortorium, New York State College of Agriculture and Life Sciences, Cornell University, Ithaca, 1960–80. Author of several articles on the palm order.*

ANGIOSPERMS (in part)

H.En. **Henrik Enander.** *Former Lecturer in History, University of Stockholm.*

DENMARK (in part)

EUROPE (in part)

NORWAY (in part)

SWEDEN (in part)

He.Ni. **Henri Nicolaï.** *Emeritus Professor of Human Geography, Free University of Brussels.*

CENTRAL AFRICA (in part)

He.P. **Hermann Pálsson.** *Professor of Icelandic, University of Edinburgh. Author of Art and Ethics in Hrafnkel's Saga; translator of Hrafnkel's Saga and other Icelandic stories.*

LITERATURE, THE ART OF (in part)

He.R. **Helmuth Rogge.** *Chief Archivist, National Records Office, Potsdam, Germany, 1921–45. Author of Friedrich von Holstein, Lebensbekenntnis in Briefen an eine Frau and several other books on Holstein.*

HOLSTEIN, FRIEDRICH VON (Micropædia)

H.E.R. **Hugh E. Richardson.** *Member, Indian Civil Service, 1930–50; Indian Trade Agent, Gyantse, and Officer in Charge, Indian Mission, Lhasa, 1936–40 and 1946–50. Author of Tibet and Its History and others.*

CHINA (in part)

H.E.R.G. **Helmut Erich Robert Gernsheim** (d. 1995). *Photo-historian and author. Founder of the Gernsheim Collection. Regents Professor of Art, University of California, Riverside, 1984. Guest Professor, University of California, Santa Barbara, 1985 and 1989. Author of The History of Photography and many others.*

PHOTOGRAPHY (in part)

He.S. **Henri Stern.** *Former Director of Research, National Centre for Scientific Research, Paris. Author of Le Calendrier de 354; L'Art byzantin.*

ARCHITECTURE, THE HISTORY OF WESTERN (in part)

PAINTING, THE HISTORY OF WESTERN (in part)

SCULPTURE, THE HISTORY OF WESTERN (in part)

He.Th. **Helmuth Thomsen** (d. 1978). *Principal Curator, Museum for the History of Hamburg, West Germany, 1957–71. Author of Liebes altes Hamburg; editor of Hamburg.*

HAMBURG (in part)

He.W. **Hellmut Wilhelm** (d. 1990). *Professor of Chinese History and Literature, University of Washington,*

Seattle. Author of Change: Eight Lectures on the I Ching and others.

CHINESE LITERATURE (in part)

H.E.W. Harold E. Wethey (d. 1984). *Professor of the History of Art, University of Michigan, Ann Arbor, 1946–72. Author of Colonial Architecture and Sculpture in Peru; El Greco and His School; The Complete Paintings of Titian.*

ARCHITECTURE, THE HISTORY OF WESTERN (in part)

GIORGIONE (Micropædia)

GRECO, EL (Micropædia)

TITIAN (in part)

H.Ey. Henry Eyring (d. 1981). *Distinguished Professor of Chemistry and Professor of Metallurgy, University of Utah, Salt Lake City, 1967–81. Coauthor of Quantum Chemistry; Theory of Rate Processes.*

CHEMICAL REACTIONS (in part)

H.F. Hermann Friedrich. *Director, Overseas Museum, Bremen, West Germany, 1962–70. Author of Marine Biology.*

EUROPE (in part)

H.F.A. Héctor Fernando Avila. *Former Division Chief, International Monetary Fund Institute, Washington, D.C.*

SOUTH AMERICA (in part)

H.F.A.V.d.W. Herman F.A. Van der Wee. *Emeritus Professor of Social and Economic History, Catholic University of Louvain, Belgium. Author of The Growth of the Antwerpen Market and the European Economy.*

BELGIUM (in part)

H.F.C. Howard F. Cline (d. 1971). *Director, Hispanic Foundation, Library of Congress, Washington, D.C., 1952–71. Author of Mexico: Revolution to Evolution, 1940–1960 and others.*

MEXICO (in part)

H.F.D. Hugh F. Denman. *Benzion Margulies Lecturer in Yiddish, University College, University of London.*

YIDDISH LITERATURE (in part)

H.Fe. Herbert Feigl (d. 1988). *Professor of Philosophy, University of Minnesota, Minneapolis, 1941–71; Director, Minnesota Center for Philosophy of Science, 1953–71. Original member of the Vienna Circle, which developed the Positivist movement. Author of "The Wiener Kreis in America" in The Intellectual Migration: Europe and America, 1930–1960.*

PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (in part)

H.F.G. Hesse Filmore Garner. *Emeritus Professor of Geology, Rutgers University, Newark, New Jersey. Author of The Origin of Landscapes.*

CONTINENTAL LANDFORMS (in part)

H.F.Gr. Hugh F. Graham (d. 1994). *Professor of History, California State University, Bakersfield.*

EDUCATION, HISTORY OF (in part)

H.F.J. Herbert Felix Jolowicz (d. 1954). *Regius Professor of Civil Law, University of Oxford, 1948–54. Professor of Roman Law, University of London, 1931–48; Dean,*

Faculty of Law, 1937–38. Author of Historical Introduction to the Study of Roman Law.

LEGAL SYSTEMS, THE EVOLUTION OF MODERN WESTERN (in part)

H.F.K. H.F. Koepfer. *Professor of Architectural History, California State Polytechnic University, Pomona. Author of American Architecture, 1607–1976.*

AALTO, ALVAR (Micropædia)

GROPIUS, WALTER (Micropædia)

SAARINEN, EERO (Micropædia)

SULLIVAN, LOUIS (Micropædia)

H.F.L. Harvey F. Lodish. *Professor of Biology, Massachusetts Institute of Technology, Cambridge. Member, Whitehead Institute for Biomedical Research, Cambridge, Massachusetts. Coauthor of Molecular Cell Biology.*

CELLS (in part)

H.F.P. H.F. Pearson (deceased). *Author of A Popular History of Singapore; This Other India: A Biography of Sir Thomas Stamford Raffles.*

RAFFLES, SIR STAMFORD (Micropædia)

H.Fr. Herbert Franke. *Emeritus Professor of Far Eastern Studies, Ludwig Maximilian University of Munich, Germany. Author of China Under Mongol Rule and others.*

CHINA (in part)

H.Fra. Heinrich Fraenkel (d. 1986). *Freelance writer. Author of The Other Germany; coauthor of Hermann Göring.*

GÖRING, HERMANN (in part) (Micropædia)

H.F.W. Harold F. Walton. *Emeritus Professor of Chemistry, University of Colorado, Boulder. Coauthor of Ion Exchange in Analytical Chemistry.*

CHEMICAL REACTIONS (in part)

H.F.We. Heinz Fritz Wermuth. *Former Curator of Herpetology, State Museum of Natural History, Ludwigsburg, West Germany. Coauthor of Schildkröten, Krokodile, Brückenechsen.*

REPTILES (in part)

H.G. Herbert V. Guenther. *Emeritus Professor of Far Eastern Studies, University of Saskatchewan, Saskatoon. Author of Tibetan Buddhism Without Mystification and others.*

BUDDHISM, THE BUDDHA AND (in part)

H.G.D. H. Grady Davis (d. 1975). *Professor of Functional Theology, Lutheran School of Theology at Chicago. Coauthor of The Gospels in Study and Preaching.*

BIBLICAL LITERATURE AND ITS CRITICAL INTERPRETATION (in part)

H.G.Do. Herndon G. Dowling. *Emeritus Professor of Biology, New York University, New York City. Curator of Reptiles, New York Zoological Park, 1960–67.*

REPTILES (in part)

H.G.E. Heinrich Gustav Euler. *Professor of Modern History, University of Würzburg, Germany. Author of Napoleon III. in seiner Zeit, (vol. I).*

NAPOLEON III (FRANCE) (Micropædia)

H.G.G. Hans G. Güterbock. *Tiffany and Margaret Blake Distinguished Service Professor Emeritus of Hittitology, Oriental*

Institute, University of Chicago. Author of Siegel aus Boğazköy and others.

BOĞAZKÖY (Micropædia)

H.Gi. Heiner Gillmeister. *Professor of Middle English, University of Bonn, Germany, and scholar in sports history.*

SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

H.G.K. Helmut Georg Koenigsberger. *Emeritus Professor of History, King's College, University of London. Author of Medieval Europe, 400–1500; Early Modern Europe, 1500–1789; and others.*

ALBA, FERNANDO ALVAREZ DE TOLEDO Y PIMENTEL, 3^o DUQUE DE (Micropædia)

JIMÉNEZ DE CISNEROS, FRANCISCO, CARDENAL (Micropædia)

PHILIP II (SPAIN) (Micropædia)

SPAIN (in part)

H.G.M. Harold G. Marcus. *Distinguished Professor of History and African Studies, Michigan State University, East Lansing. Author of A History of Ethiopia and others.*

EASTERN AFRICA (in part)

H.G.N. Herbert G. Nicholas. *Rhodes Professor Emeritus of American History and Institutions, University of Oxford. Author of Britain and the U.S.A. and others.*

CHURCHILL

H.Go. Hermann Goetz (d. 1976). *Director, Baroda Museum and Picture Gallery, Baroda, India, 1940–53. Curator, National Gallery of Modern Art, New Delhi, 1953–55. Author of The Art of India and others.*

DECORATIVE ARTS AND FURNISHINGS (in part)

H.Gr. Holger Gruner. *Managing Director, Beak Consultants GmbH, Freiburg, Germany. Former Project Manager, Flotation Department, FIA, Freiburg.*

INDUSTRIES, EXTRACTION AND PROCESSING (in part)

H.G.R. Henry Godfrey Roseveare. *Professor of History, King's College, University of London. Author of The Treasury: The Evolution of a British Institution.*

CHARLES II (GREAT BRITAIN) (Micropædia)

H.Gu. Henri Guitton. *Emeritus Professor of Economics, University of Paris I. Editor in Chief, La Revue d'Économie Politique.*

ECONOMIC THEORY (in part)

H.H.A. H. Harvard Arnason (d. 1986). *Art historian. Vice President for Art Administration, Solomon R. Guggenheim Foundation, New York City, 1961–69. Author of History of Modern Art; coauthor of two books on Alexander Calder; and others.*

CALDER, ALEXANDER (Micropædia)

H.H.A.B. Hans H.A. Bielenstein. *Dean Lung Professor Emeritus of Chinese, Columbia University. Author of "The Restoration of the Han Dynasty" in Bulletin of the Museum of Far Eastern Antiquities and other articles.*

WANG MANG (Micropædia)

H.He. **Herbert Hensel** (d. 1983). *Professor of Physiology; Director, Institute of Physiology, Philipps University of Marburg, West Germany. Coauthor of Temperatur und Leben.*
SENSORY RECEPTION (in part)

H.Hei. **Helmut Heiber.** *Assistant, Institute for Contemporary History, Munich, Germany. Author of Joseph Goebbels and others.*
GOEBBELS, JOSEPH (Micropædia)

H.H.Hu. **Herbert Henry Huxley.** *Emeritus Professor of Classics, University of Victoria, British Columbia. Supervisor in Classics, St. John's College, University of Cambridge, 1979–85. Editor of Virgil's Georgics (Books I and IV) and others.*
MARTIAL (Micropædia)

H.Hi. **Howard Hibbard** (d. 1984). *Professor of Art History, Columbia University, 1966–84. Author of Bernini and others.*

BERNINI, GIAN LORENZO (in part)
(Micropædia)

H.-H.J. **Hans-Heinrich Jescheck.** *Emeritus Professor of Law, Albert Ludwig University of Freiburg, Freiburg im Breisgau, Germany. Emeritus Director, Max Planck Institute for Foreign and International Criminal Law, Freiburg. Author of Lehrbuch des Strafrechts.*
CRIMINAL LAW
PROCEDURAL LAW (in part)

H.H.K. **Howard H. Kendler.** *Emeritus Professor of Psychology, University of California, Santa Barbara. Author of Historical Foundations of Modern Psychology and others.*
LEARNING AND COGNITION, HUMAN (in part)

H.H.L. **Hubert Horace Lamb.** *Former Director, Climatic Research Unit, School of Environmental Sciences, University of East Anglia, Norwich, England. Investigator of climatic variation from the viewpoint of general atmospheric circulation. Author of Climate: Present, Past and Future and others.*
CLIMATE AND WEATHER (in part)

H.Hn. **Herbert Hoffmann.** *Former Curator of Ancient Art, Museum of Art and Industry, Hamburg, Germany.*
ARCHITECTURE, THE HISTORY OF WESTERN (in part)

H.Ho. **Harmannus Hoetink.** *Emeritus Professor of Cultural Anthropology and Comparative Sociology of Latin America and the Caribbean, Institute of Cultural Anthropology, State University of Utrecht, The Netherlands. Author of Slavery and Race Relations in the Americas and others.*
WEST INDIES, THE (in part)

H.H.R. **Harry Howe Ransom.** *Emeritus Professor of Political Science, Vanderbilt University, Nashville, Tennessee. Author of The Intelligence Establishment.*
INTELLIGENCE AND COUNTERINTELLIGENCE (in part)

H.H.S. **Howard Hayes Scullard** (d. 1983). *Professor of Ancient History, King's College, University of London, 1959–70. Author of Roman Politics, 220–150 B.C. and others.*

GREEK AND ROMAN CIVILIZATIONS, ANCIENT (in part)

SCIPIO AFRICANUS THE ELDER (in part)
(Micropædia)

SCIPIO AFRICANUS THE YOUNGER (in part)
(Micropædia)

SYRIA (in part)

H.I. **Halil Inalcik.** *University Professor Emeritus of History, University of Chicago. Author of "Mehmed the Conqueror (1432–1481) and His Time" in Speculum and others.*
MEHMED II (Micropædia)

Hi.K. **Hideomi Kodama.** *Senior Research Scientist (soil mineralogy), Centre for Land and Biological Resources Research, Agriculture and Agri-Food Canada, Ottawa.*

MINERALS AND ROCKS (in part)

H.-I.M. **Henri-Irénée Marrou** (d. 1977). *Professor of the History of Ancient Christianity, University of Paris, 1945–75. Author of De la connaissance historique.*
EDUCATION, HISTORY OF (in part)

Hi.Mo. **Hiroyuki Momo.** *Emeritus Professor and former Director, Historiographical Institute, University of Tokyo.*
HISTORY, THE STUDY OF (in part)

H.Is. **Hildebert Isnard** (d. 1983). *Professor of Geography, University of Nice, France. Professor of Geography, University of Aix-Marseille II, Aix-en-Provence, France, 1947–70. Author of Géographie du Maghreb; Afrique tropicale; and others.*
AFRICA (in part)

H.I.S. **Harold I. Sharlin.** *Former Professor of History, Iowa State University, Ames. Author of The Making of the Electrical Age; Lord Kelvin: Dynamic Victorian.*

KELVIN

H.J.Bi. **Harold J. Bissell.** *Emeritus Professor of Geology, Brigham Young University, Provo, Utah.*
MINERALS AND ROCKS (in part)

H.J.Bl. **Henry J. Blumenthal.** *Reader in Greek, University of Liverpool, England. Coeditor of Soul and the Structure of Being in Late Neoplatonism.*
PLATONISM, PLATO AND (in part)

H.J.Bn. **Henry J. Bruman.** *Emeritus Professor of Geography, University of California, Los Angeles.*
NORTH AMERICA (in part)

H.J.C. **Henry J. Cadbury** (d. 1974). *Hollis Professor of Divinity, Harvard University, 1934–54. Chairman, American Friends Service Committee, 1928–34; 1944–60.*
FOX, GEORGE (Micropædia)

H.J.Cr. **Howard J. Critchfield.** *Professor of Geography, Western Washington University, Bellingham. Author of General Climatology.*

UNITED STATES OF AMERICA (in part)

H.J.D. **Hubert Jules Deschamps** (d. 1979). *Professor of Modern History of Black Africa, University of Paris, 1962–70. Colonial Administrator, Madagascar,*

1926–36. *Author of History of Madagascar and others.*

MADAGASCAR (in part)

WESTERN AFRICA (in part)

H.J.De. **Henri J. Delporte.** *Honorary Inspector General, Museums of France; former Chief Curator, Museum of National Antiquities, Saint-Germain-en-Laye, France. Author of Archéologie et réalité and others.*

EVOLUTION, HUMAN (in part)

H.J. de V. **Herman Jean de Vleeschauwer.** *Emeritus Professor of Philosophy, University of South Africa, Pretoria. Author of L'Évolution de la pensée kantienne; editor of Kantstudien.*
KANTIANISM, KANT AND (in part)

H.J.D'S. **Harry Joseph D'Souza.** *Professor of Mathematics at the University of Michigan, Flint.*
GEOMETRY (in part)

H.J.Dw. **Harvey J. Dworken, M.D.** *Emeritus Professor of Medicine, Case Western Reserve University, Cleveland, Ohio. Author of Gastroenterology: Pathophysiology and Clinical Applications and others.*
DIGESTION AND DIGESTIVE SYSTEMS (in part)

H.J.Er. **Hubert Joseph Erb.** *Berlin Correspondent, Associated Press.*
BERLIN (in part)

H.-J.I. **Heinz-Jürgen Ipfling.** *Professor of Educational Theory, University of Regensburg, Germany. Author and editor of works on education.*
EDUCATION, HISTORY OF (in part)

H.J.S. **Howard James Stains.** *Emeritus Professor of Zoology, Southern Illinois University at Carbondale. Author of "Carnivores and Pinnipeds" in Recent Mammals of the World.*
MAMMALS (in part)

H.J.Sp. **Herbert John Spiro.** *University Professor of Politics, John F. Kennedy Institute for North American Studies, Free University of Berlin, 1980–89. U.S. Ambassador to Cameroon, 1975–77. Author of Government by Constitution and others.*

CONSTITUTION AND CONSTITUTIONAL GOVERNMENT (in part)

H.J.Wi. **Howard J. Wiarda.** *Professor of Political Science, University of Massachusetts at Amherst. Author of The Politics of External Influence in the Dominican Republic and others.*
WEST INDIES, THE (in part)

H.K. **Hans Kohn** (d. 1971). *Professor of History, City College, City University of New York, 1949–62. Author of Political Ideologies of the Twentieth Century.*

ISRAEL (in part)

SOCIO-ECONOMIC DOCTRINES AND REFORM MOVEMENTS, MODERN (in part)

H.Ka. **Harry Kalven, Jr.** (d. 1974). *Harry A. Bigelow Professor of Law, University of Chicago, 1953–74. Coauthor of The American Jury.*

JUDICIAL AND ARBITRATIONAL SYSTEMS (in part)

H.Ke. **Hugh Kennedy.** *Reader in Mediaeval History, University of St. Andrews, Scotland. Author of The Prophet and the Age of the Caliphates.*
IRAQ (in part)

H.K.G. **Harry K. Girvetz** (d. 1974). *Professor of Philosophy, University of California, Santa Barbara, 1951–74. Author of The Evolution of Liberalism.*
SOCIO-ECONOMIC DOCTRINES AND REFORM MOVEMENTS, MODERN (in part)

H.K.M.S. **H.K. Manmohan Singh.** *Emeritus Professor of Economics, Punjabi University, Patiala, India; former Vice-Chancellor.*
INDIA (in part)

H.Ko. **Horst Koegler.** *Music Editor, Stuttgarter Zeitung. Editor, Ballett (annual), 1965–83. Author of Concise Oxford Dictionary of Ballet.*
DANCE, THE HISTORY OF WESTERN (in part)

H.Kü. **Hans Kühner** (d. 1986). *Historian and freelance writer. Specialist on the history of the Roman Catholic Church and the Papacy. Author of Encyclopedia of the Papacy and others.*
GREGORY I, SAINT (PAPACY) (Micropædia)
JULIUS II (Micropædia)

H.K.V. **Hans K. Vogt** (deceased). *Professor of General Linguistics, University of Oslo, Norway. Author of Grammaire du géorgien moderne.*
LANGUAGES OF THE WORLD (in part)

H.L. **Henri Laoust** (d. 1983). *Professor of Sociology of Islām, College of France, Paris, 1956–76. Editor and translator of Le Traité de droit public d'Ibn Taimiya.*
IBN TAYMIYAH (Micropædia)

H.L.A.H. **Herbert Lionel Adolphus Hart** (d. 1992). *Principal of Brasenose College, Oxford, 1973–78; Professor of Jurisprudence, University of Oxford, 1952–68. Author of The Concept of Law; Law, Liberty and Morality.*
AUSTIN, JOHN (Micropædia)

H.L.B. **Henry Lewis Barnett, M.D.** *Emeritus Professor of Pediatrics, Albert Einstein College of Medicine, Yeshiva University, Bronx, New York. Medical Director, Children's Aid Society, New York City.*
CHILDHOOD DISEASES AND DISORDERS (in part)

H.L.C. **Hampton L. Carson.** *Emeritus Professor of Genetics, University of Hawaii at Manoa, Honolulu. Author of Heredity and Human Life.*
GENETICS AND HEREDITY, THE PRINCIPLES OF (in part)

H.L.C.J. **Hans L.C. Jaffé** (d. 1984). *Professor of Modern Art History, University of Amsterdam, 1963–84. Author of Piet Mondrian; Picasso.*
MONDRIAN, PIET (in part) (Micropædia)

H.L.E. **Herbert Leeson Edlin** (d. 1976). *Publications Officer, Forestry Commission of Great Britain, London. Author of Trees, Woods and Man.*
FORESTRY AND WOOD PRODUCTION (in part)

H.-L.-É.T. **Henri-Louis-Étienne Terrasse** (d. 1971). *Curator, Historic*

Monuments of Morocco, 1935–57. Director, Institute for Advanced Moroccan Studies, Rabat, Morocco, 1941–57. Chairman, Department of Islāmic Archaeology, University of Algiers, 1945–57. Director, Casa de Velázquez, Ciudad University, Madrid, 1957–65. Author of Histoire du Maroc.
'ABD AL-MUMIN (Micropædia)

H.Li. **Heinz Lieberich.** *General Director, Bavarian State Archives, Munich. Author of Ludwig der Bayer als Gesetzgeber and others.*
LOUIS IV (GERMANY/HOLY ROMAN EMPIRE) (Micropædia)

H.L.-J. **Sir Hugh Lloyd-Jones.** *Regius Professor of Greek, University of Oxford, 1960–89. Author of The Justice of Zeus.*
SCHOLARSHIP, CLASSICAL

H.L.Ke. **Herbert Leon Kessler.** *Professor of the History of Art, Johns Hopkins University, Baltimore. Author of French and Flemish Illuminated Manuscripts in Chicago Collections.*
EYCK, JAN VAN (Micropædia)
WEYDEN, ROGIER VAN DER (Micropædia)

H.L.M. **Hanns Leo Mikoletzky** (d. 1978). *General Director, Austrian State Archives, Vienna. Professor of History, University of Vienna. Author of Kaiser Heinrich II und die Kirche and others.*
HENRY III (GERMANY/HOLY ROMAN EMPIRE) (Micropædia)

H.L.Ms. **Hallam L. Movius, Jr.** (d. 1987). *Professor of Anthropology, Harvard University; Curator of Paleolithic Archaeology, Peabody Museum.*
PREHISTORIC PEOPLES AND CULTURES (in part)

H.L.P. **Herbert L. Petri.** *Professor of Psychology, Towson State University, Maryland. Author of Motivation: Theory, Research, and Applications.*
MOTIVATION, HUMAN (in part)

H.M. **Hermann Mannheim** (d. 1974). *Reader in Criminology, University of London, 1946–55. Author of Comparative Criminology.*
SOCIAL SCIENCES, THE (in part)

H.M.A. **Harold Maurice Abrahams** (d. 1978). *Broadcaster and journalist. Chairman, British Amateur Athletic Board. Olympic Gold Medalist (100-metre dash), 1924. Author of The Olympic Games, 1896–1952.*
OLYMPIC GAMES (in part)

H.Me. **Henk Meijer.** *Director, Information and Documentation Centre for the Geography of the Netherlands, State University of Utrecht. Author of A Compact Geography of the Netherlands.*
NETHERLANDS, THE (in part)

H.M.K. **Horace M. Kallen** (d. 1974). *Professor of Social Philosophy, New School for Social Research, New York City, 1919–52. Author of the introduction to The Philosophy of William James, Drawn from His Own Works.*
JAMES, WILLIAM (Micropædia)

H.M.L. **Henry M. Leicester** (d. 1991). *Professor of Biochemistry, University of the*

Pacific, San Francisco, 1948–77. Coauthor of Source Book in Chemistry 1400–1900.
LIEBIG, JUSTUS, FREIHERR VON (Micropædia)
WÖHLER, FRIEDRICH (Micropædia)

H.M.La. **Hugh Michael Laracy.** *Associate Professor of History, University of Auckland, New Zealand.*
PACIFIC ISLANDS (in part)

H.M.M. **Harold M. Mayer** (d. 1994). *Professor of Geography, University of Wisconsin, Milwaukee, 1974–94. Author of The Port of Chicago and the St. Lawrence Seaway; coauthor of Chicago, Growth of a Metropolis.*
CHICAGO (in part)

H.M.P. **Henri M. Peyre** (d. 1988). *Distinguished Professor of French, Graduate Center, City University of New York, 1969–81. Sterling Professor of French, Yale University, 1938–69. Author of Literature and Sincerity and many others.*
DURKHEIM, ÉMILE (Micropædia)
LITERATURE, THE ART OF (in part)

H.M.S. **Harold M. Somers.** *Emeritus Professor of Economics, University of California, Los Angeles; Dean, Division of Social Sciences, 1967–70. Author of Capital Gains, Death and Gift Taxation.*
TAXATION (in part)

H.Mu. **Hugo Munsterberg** (d. 1995). *Fellow and Professor of Oriental Art, Bard College, Annandale-on-Hudson, New York, 1978–88. Author of The Arts of Japan.*
OGATA KÖRIN (Micropædia)
SESSHŪ (Micropædia)
SÔTATSU (Micropædia)

H.M.V.D. **Hobart Merritt Van Deusen** (d. 1976). *Archbold Assistant Curator, Department of Mammalogy, American Museum of Natural History, New York City, 1958–75. Coauthor of "Marsupials" in Recent Mammals of the World.*
MAMMALS (in part)

H.M.W. **Helen Margaret Wallis** (d. 1995). *Map Librarian, British Library, London, 1967–86. Editor of Carteret's Voyage Round the World and others.*
TASMAN, ABEL JANSZON (Micropædia)

H.My. **Hla Myint.** *Emeritus Professor of Economics, London School of Economics and Political Science, University of London. Author of Economic Theory and the Underdeveloped Countries.*
ECONOMIC GROWTH AND PLANNING (in part)

H.N. **Heinrich Nagel.** *Emeritus Professor of Civil and International Civil Procedure, Georg August University of Göttingen, Germany. Former Presiding Judge, Hanseatic Court of Appeals, Bremen. Author of Internationales Zivilprozessrecht and others.*
PROCEDURAL LAW (in part)

H.Ne. **Howard Nemerov** (d. 1991). *Poet and novelist. Edward Mallinckrodt Distinguished Professor of English, Washington University, St. Louis, Missouri, 1976–90. Poet Laureate of the U.S., 1988–90. Author of Poetry and Fiction: Essays; Reflexions on Poetry and Poetics; and others.*
LITERATURE, THE ART OF (in part)

Hn.G. Dame Helen Gardner (d. 1986). *Merton Professor of English Literature, University of Oxford; Fellow of Lady Margaret Hall, Oxford, 1966–75.*
ELIOT, T.S. (in part) (Micropædia)

H.O. Harold Oldroyd (deceased). *Senior Principal Scientific Officer, British Museum (Natural History), London, 1964–73. Author of The Natural History of Flies and others.*
INSECTS (in part)

Ho.B. Howard Bay (d. 1986). *Stage and film designer. Professor of Theatre Arts, Brandeis University, Waltham, Massachusetts. Author of Stage Design.*
THEATRICAL PRODUCTION (in part)

Ho.I.P. Hovhanness Israel Pilikian. *Theatre director. Founder and Artistic Director of Hano-no Mask-Theatre Company. Author of The Prince of Darkness and others.*
REINHARDT, MAX (in part) (Micropædia)

H.O.Sc. Hans Otto Schmitt. *Senior Adviser, International Monetary Fund, Washington, D.C.; Division Chief, 1971–80.*
ECONOMIC THEORY (in part)

H.P. Heinrich Potthoff. *Contributor, Commission for the History of Parliamentarism and Political Parties, Bonn, Germany. Author of Die deutsche Politik Beusts and others.*
BEUST, FRIEDRICH FERDINAND, GRAF VON (Micropædia)

H.Pa. Hans Patze. *Professor of German History; Director, Institute for Historical Research, Georg August University of Göttingen, Germany. Author of Die Entstehung der Landesherrschaft in Thüringen.*

FREDERICK I (GERMANY/HOLY ROMAN EMPIRE) (Micropædia)

H.P.La. Harriet Pratt Lattin (deceased). *Historian. Author of The Peasant Boy Who Became Pope; translator of The Letters of Gerbert, with His Papal Privileges as Sylvester II.*
SYLVESTER II (Micropædia)

H.Pr. Helmut Preidel. *Historian. Author of Das grossmährische Reich im Spiegel der Bodenfunde and others.*
CHARLES IV (GERMANY/HOLY ROMAN EMPIRE) (Micropædia)

H.P.R. Humphrey P. Rang. *Director, Sandoz Institute for Medical Research, London. Coauthor of Pharmacology.*
DRUGS AND DRUG ACTION (in part)

H.P.Tr. Hamilton P. Traub (d. 1983). *Editor, Plant Life, American Plant Life Society, La Jolla, California. Author of The Amaryllis Manual and others.*
ANGIOSPERMS (in part)

H.P.V. Homero Pozo Vélez. *Professor of History and Geography, National University of Loja, Ecuador. President, National High School "Adolfo Valarezo," Loja.*
ECUADOR (in part)

H.R. Helmer Ringgren. *Emeritus Professor of Old Testament Exegesis, University of Uppsala, Sweden. Author of*

Israelite Religion; Messiah in the Old Testament; and various articles on theological concepts in the Qur'ān.
ISLĀM, MUHAMMAD AND THE RELIGION OF (in part)

H.Ra. Hassanein Muhammad Rabie. *Professor of History, University of Cairo. Author of The Financial System of Egypt: A.H. 564–741/A.D. 1169–1341.*
BAYBARS I (Micropædia)

H.R.C. H. Russell Cross. *Professor of Animal Science, Nutritional Sciences, and of Food Science and Technology; Director, Institute of Food Science and Engineering, Texas A&M University, College Station. Coeditor of Meat Science and Technology Proceedings: An International Symposium.*
FOOD PROCESSING (in part)

H.Re. Hans Reichardt (d. 1991). *Professor of Mathematics, Humboldt University of Berlin. Editor of C.F. Gauss Gedenkband anlässlich des 100. Todestages am 23. Februar 1855.*
GAUSS

H.R.H. Heribert R. Hutter. *Former Director, Gallery of the Academy of Fine Arts, Vienna. Author of Drawing: History and Technique and others.*
DRAWING (in part)

H.Ro. Herbert H. Rowen. *Emeritus Professor of History, Rutgers University, New Brunswick, New Jersey. Author of The Princes of Orange and others.*
NETHERLANDS, THE (in part)

H.R.T. Hugh Russell Tinker. *Emeritus Professor of Politics, University of Lancaster, England. Author of India and Pakistan: A Political Analysis and others.*
BANGLADESH (in part)
PAKISTAN (in part)

H.R.W. Henry R. West. *Professor of Philosophy, Macalester College, St. Paul, Minnesota. Coeditor of Moral Philosophy.*
PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (in part)

H.S. Helmut Sick. *Naturalist, Brazilian Academy of Sciences, Rio de Janeiro. Author of numerous papers on neotropical birds.*
BIRDS (in part)

H.Sa. Heinrich Satter. *Freelance writer. Author of Paul Ehrlich, Begründer der Chemotherapie and others.*
EHRlich, PAUL (Micropædia)

H.Se. Humphrey Searle (d. 1982). *Composer. Professor of Composition, Royal College of Music, London. Author of The Music of Liszt and others.*
LISZT, FRANZ (in part) (Micropædia)

H.S.H.-P. Helen Sawyer Hogg-Priestly (d. 1993). *Professor of Astronomy, University of Toronto, 1957–76. Astronomy columnist, Toronto Daily Star, 1951–81.*
STARS AND STAR CLUSTERS (in part)

H.S.N. H.S. Narayana. *Former Professor of Botany, University of Rājasthān, Jaipur, India.*
ANGIOSPERMS (in part)

H.Sp. Herbert Spiegelberg (d. 1990). *Professor of Philosophy, Washington University, St. Louis, Missouri, 1963–71.*

Author of The Phenomenological Movement.

PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (in part)

H.S.P. H. Steffen Peiser. *Consultant. Chief, Office of International Relations, National Bureau of Standards, U.S. Department of Commerce, Washington, D.C., 1969–79. Author of X-Ray Diffraction by Polycrystalline Materials.*
ATOMIC WEIGHT (in part) (Micropædia)

H.Sr. Hugo Stehkämper. *Former Director, Historical Archives, Cologne, Germany.*
COLOGNE (in part)

H.S.R. Hans Siegbert Reiss. *Emeritus Professor of German, University of Bristol, England. Author of Goethe's Novels and others.*
GERMAN LITERATURE (in part)

H.Ss. Halsey Stevens (d. 1989). *Composer. Professor of Music, University of Southern California, Los Angeles, 1951–76. Author of The Life and Music of Béla Bartók.*
BARTÓK, BÉLA (Micropædia)

H.S.Sc. Herbert S. Schell (d. 1994). *Dean of the Graduate School, University of South Dakota, Vermillion, 1951–64; Professor of History, 1934–69. Author of History of South Dakota.*
UNITED STATES OF AMERICA (in part)

H.S.-Sm. Sir Hubert Shirley-Smith (d. 1981). *Consulting Engineer to W.V. Zinn & Associates, London, 1969–78. President, Institute of Civil Engineers, 1967. Author of The World's Great Bridges.*
PUBLIC WORKS (in part)

H.St. Hans Sturmberger. *Former Director, Upper Austrian Provincial Archives, Linz. Author of Kaiser Ferdinand II and others.*
FERDINAND II (GERMANY/HOLY ROMAN EMPIRE) (Micropædia)

H.S.T. H.S. Thayer. *Emeritus Professor of Philosophy, City College, City University of New York. Author of Meaning and Action: A Critical History of Pragmatism.*
PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (in part)

H.S.Ta. Sir Hugh S. Taylor (d. 1974). *Professor of Chemistry, 1922–58; Dean of the Graduate School, 1945–58, Princeton University. Coauthor of Catalysis in Theory and Practice.*
CHEMICAL REACTIONS (in part)

H.St.J.B.P. Harry St. John Bridger Philby (d. 1960). *Explorer in Arabia. Author of The Heart of Arabia.*
ARABIA (in part)

H.S.-W. Hugh Seton-Watson (d. 1984). *Professor of Russian History, University of London, 1951–83. Author of The Russian Empire, 1801–1917.*
RUSSIA (in part)

H.T. Holger Thesleff. *Emeritus Professor of Greek, University of Helsinki, Finland. Author of An Introduction to the Pythagorean Writings of the Hellenistic Period and others.*

PHILOSOPHICAL SCHOOLS AND DOCTRINES,
WESTERN (in part)

H.Ta. Hugh Tait. *Deputy Keeper, Department of Medieval and Later Antiquities, British Museum, London. Author of Porcelain and others.*

DECORATIVE ARTS AND FURNISHINGS
(in part)

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ANGIOSPERMS (in part)

H.T.D. Harry T. Dickinson. *Professor of History, University of Edinburgh. Author of Bolingbroke and others.*

BOLINGBROKE, HENRY SAINT JOHN, 1ST VISCOUNT (Micropædia)

Ht.F. Hellmut Fritzsche. *Louis Block Professor of Physics, University of Chicago. Coauthor and editor of Advances in Disordered Semiconductors (2 vol.).*

ELECTROMAGNETIC RADIATION (in part)

H.T.F. Harold T. Friermood. *Former Chairman, Education Council, United States Olympic Committee. Editor of Handball: Official, Unified-Playing Rules and others.*

HANDBALL (Micropædia)

H.Th. Helmut Thielicke (d. 1986). *Professor of Systematic Theology, University of Hamburg, 1954–74. Author of Theological Ethics and others.*

THEOLOGY

H.T.H. Herbert T. Hoover. *Professor of History, University of South Dakota, Vermillion. Author of The Yankton Sioux and others.*

UNITED STATES OF AMERICA (in part)

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FRENCH LITERATURE (in part)

H.T.P. Hugh T. Patrick. *R.D. Calkins Professor of International Business; Director, Center on Japanese Economy and Business, Columbia University. Author of Monetary Policy and Central Banking in Contemporary Japan and others.*

MARKETS (in part)

H.U. Homer Ulrich (d. 1987). *Professor and Head, Department of Music, University of Maryland, College Park, 1953–72. Editor, American Music Teacher, 1973–87. Author of Chamber Music and others.*

MUSICAL FORMS AND GENRES (in part)

H.-U.H. Hanns-Ulrich Haedeke. *Former Director, German Sword Museum, Solingen, Germany. Author of Metalwork and others.*

DECORATIVE ARTS AND FURNISHINGS
(in part)

Hu.M. Hugh Sinclair Morrison (d. 1978). *Leon E. Williams Professor of Art, Dartmouth College, Hanover, New Hampshire, 1963–69. Author of Early American Architecture; Louis Sullivan. ARCHITECTURE, THE HISTORY OF WESTERN (in part)*

Hu.S. Hudson Strode (d. 1976). *Professor of English, University of Alabama, Tuscaloosa, 1924–63. Author of Jefferson Davis and others.*

DAVIS, JEFFERSON (in part) (Micropædia)

H.U.S. Harald Ulrik Sverdrup (d. 1957). *Director, Norwegian Polar Research Institute, Oslo, 1948–57. Director, Scripps Institution of Oceanography, University of California, San Diego, at La Jolla, 1936–48. Author of Oceanography for Meteorologists and others.*

ATLANTIC OCEAN, THE (in part)

NANSEN, FRIDTJOF (Micropædia)

Hu.Wa. Hugh Wakefield (d. 1984). *Keeper, Department of Circulation, Victoria and Albert Museum, London, 1960–75. Author of Nineteenth Century British Glass; Victorian Pottery.*

DECORATIVE ARTS AND FURNISHINGS
(in part)

H.V. Hans Volkmann (deceased). *Professor of Ancient History, University of Cologne, West Germany.*

ANTIGONUS I MONOPHTHALMUS
(Micropædia)

ANTIGONUS II GONATAS (Micropædia)

ANTIOCHUS III (Micropædia)

ANTIOCHUS IV EPIPHANES (Micropædia)

H. van W. H. van Werveke (d. 1974). *Professor of the History of Belgium, State University of Ghent, Belgium.*

ARTEVELDE, JACOB VAN (Micropædia)

H.V.L. Harold V. Livermore. *Emeritus Professor of Spanish and Portuguese, University of British Columbia, Vancouver. Author of Origins of Spain and Portugal and others.*

ALBUQUERQUE, AFONSO DE, THE GREAT
(Micropædia)

COVILHÃ, PÊRO DA (Micropædia)

DIAS, BARTOLOMEU (Micropædia)

JOHN I (PORTUGAL) (Micropædia)

JOHN II (PORTUGAL) (Micropædia)

MANUEL I (PORTUGAL) (Micropædia)

PORTUGAL (in part)

H.Wa. Hao Wang (d. 1995). *Professor of Logic, Rockefeller University, New York City, 1967–91. Author of Logic, Computers and Sets and others.*

LOGIC, THE HISTORY AND KINDS OF (in part)

H.W.B. Hendrik W. Bode (d. 1982). *Gordon McKay Professor of Systems Engineering, Harvard University, 1967–74. Author of Network Analysis and Feedback Amplifier Design.*

INDUSTRIAL ENGINEERING AND PRODUCTION
MANAGEMENT (in part)

H.W.Br. Harold Whitman Bradley (d. 1990). *Professor of History, Vanderbilt University, Nashville, Tennessee, 1954–72. Member, Tennessee House of Representatives, 1964–72. Author of The United States, 1492–1877 and others.*

JACKSON, ANDREW (in part) (Micropædia)

UNITED STATES OF AMERICA (in part)

H.We. Herbert Weinstock (d. 1971). *Consulting Editor, Alfred A. Knopf, Inc., New York City, 1963–71; Executive Editor, 1943–59. Author of The Opera; Music as an Art; and many biographies of composers.*

MUSICAL FORMS AND GENRES (in part)

H.W.F. Hubert William Frings. *David Ross Boyd Professor Emeritus of Zoology, University of Oklahoma, Norman. Coauthor of Animal Communication. SENSORY RECEPTION (in part)*

H.W.Fr. Hans Wilhelm Frei (d. 1988). *John A. Hooper Professor of Religious Studies, Yale University, 1986–88; Master, Ezra Stiles College, 1972–80. Author of The Eclipse of Biblical Narrative: A Study in Eighteenth and Nineteenth Century Hermeneutics.*

RITSCHL, ALBRECHT (in part) (Micropædia)

H.W.F.S. Henry W.F. Saggs. *Emeritus Professor of Semitic Languages, University College, Cardiff, University of Wales. Author of The Greatness That Was Babylon and others.*

BABYLON (Micropædia)

NEBUCHADREZZAR II (Micropædia)

SENNACHERIB (Micropædia)

H.W.G. Herman W. Goult (d. 1977). *Editor, Cyprus Mail, Nicosia. Cyprus correspondent, The Times (London). CYPRUS (in part)*

H.Wi. Hermann Wiesflecker. *Professor of Austrian History, University of Graz, Austria. Author of Maximilian I, Österreich, das Reich und Europa an der Wende zur Neuzeit (vol. 1–3) and others. MAXIMILIAN I (GERMANY/HOLY ROMAN EMPIRE) (Micropædia)*

H.W.J. H.W. Janson (d. 1982). *Professor of Fine Arts, Washington Square College of Arts and Science, New York University, New York City, 1949–79. Author of The Sculpture of Donatello; History of Art. DONATELLO (in part) (Micropædia)*

H.W.L. Herbert W. Levi. *Emeritus Professor of Biology, Harvard University; Curator of Arachnology, Museum of Comparative Zoology, 1966–91. Coauthor of A Guide to Spiders and Their Kin; cotranslator and coeditor of Invertebrate Zoology by A. Kaestner. ARACHNIDS (in part)*

H.W.P. Herbert William Parke (d. 1986). *Professor of Ancient History, Trinity College, University of Dublin, 1934–73. Author of Greek Mercenary Soldiers. EPAMINONDAS (Micropædia)*

H.W.W. Harold W. Wardman. *Emeritus Professor of French Studies, University of Lancaster, England. Author of Ernest Renan: A Critical Biography; Renan Historien Philosophie; and others. RENAN, ERNEST (Micropædia)*

Hy.K. Hyman Kaufman. *Professor of Mathematics, McGill University, Montreal, 1952–80. Coauthor of Table of Laplace Transforms. ANALYSIS (IN MATHEMATICS) (in part)*

H.Z. Hans Zeisel (d. 1992). *Professor of Law and Sociology, University of Chicago, 1953–76. Coauthor of The American Jury. JUDICIAL AND ARBITRATIONAL SYSTEMS (in part)*

H.Za. Harry Zarenda. *Senior Lecturer in Economics, University of the Witwatersrand, Johannesburg, South Africa. SOUTHERN AFRICA (in part)*

H.Z.D. Haim Zalman Dimitrovsky. *Professor of Talmud, Hebrew University of Jerusalem. Editor and translator of Bava metzia.*

JUDAISM (in part)

H.Zi. Harold Zirin. *Professor of Astrophysics; Director, Big Bear Solar Observatory, California Institute of Technology, Pasadena. Author of Astrophysics of the Sun and others.*

SOLAR SYSTEM, THE (in part)

I.A. Isaac Asimov (d. 1992). *Science writer. Professor of Biochemistry, Boston University, 1979–92. Author of Asimov's Biographical Encyclopedia of Science and Technology and many others.*

MICHELSON, A.A. (Micropædia)

I.A.Y. Ivan Alekseyevich Yerofeyev. *Head Geography Editor, Prosveshcheniye (educational publishers), Moscow. Author of Southwestern Economic Region; coauthor of Kiev.*

UKRAINE (in part)

I.B. Ivo Banac. *Professor of History, Yale University. Author of With Stalin Against Tito: Cominformist Splits in Yugoslav Communism and many others.*

TITO, JOSIP BROZ (Micropædia)

I.Be. Ian D. Bent. *Professor of Music, Columbia University. Author of Musical Analysis in the Nineteenth Century; text editor of The New Grove Dictionary of Music and Musicians (6th and 7th ed.).*

MUSIC, THE ART OF (in part)

I.Bo. Ira Bornstein. *Nuclear Engineer, Office of the Director, Argonne National Laboratory, Illinois.*

ENGINEERING (in part)

I.Bt. Irving Brant (d. 1976). *Member, Advisory Board, James Madison Papers, University of Chicago. Council Member, Institute of Early American History and Culture, 1959–62. Author of James Madison (6 vol.) and others.*

MADISON, JAMES (in part) (Micropædia)

I.C.B. The Rev. Ignatius Charles Brady, O.F.M. *Director of the theological section, College of St. Bonaventura, Grottaferrata, Italy, 1961–82. Coeditor and cotranslator of Francis and Clare: The Complete Works.*

FRANCIS OF ASSISI, SAINT (Micropædia)

I.C.C. Ian C. Clingan. *Former Engineer in Chief, Trinity House Lighthouse Service, London.*

PUBLIC WORKS (in part)

I.C.Cn. Ivor Cecil Coffin. *Regional Economist, Economics Department, Lloyds Bank Group, London.*

URUGUAY (in part)

I.C.M. Iseabail C. Macleod. *Editorial Director, Scottish National Dictionary Association, Edinburgh. Coeditor of Concise Scots Dictionary.*

UNITED KINGDOM (in part)

I.D.E. Ian David Edge. *Lecturer in Islamic Law; Director, Centre for Islamic and Middle-East Law, School of Oriental and African Studies, University of London.*

CRIME AND PUNISHMENT (in part)

I.D'O.E. Sir Ivo D'Oyly Elliott (d. 1961). *Indian Civil Service, 1906–32.*

TURENNE, HENRI DE LA TOUR D'AUVERGNE, VICOMTE DE (Micropædia)

I.E. Specialists, Institute of Economics, University of Havana.

WEST INDIES, THE (in part)

I.F.B. Ivor F. Burton. *Emeritus Professor of Social Policy, Bedford College, University of London. Author of The Captain-General: The Career of John Churchill, Duke of Marlborough, from 1702–1711 and others.*

MARLBOROUGH, JOHN CHURCHILL, 1ST DUKE OF (in part) (Micropædia)

PIUS V, SAINT (in part) (Micropædia)

PIUS IX (in part) (Micropædia)

I.F.G.B. Ian F.G. Baxter. *Emeritus Professor of Law, University of Toronto; former Director of Family Law Study.*

FAMILY LAW

I.Fr. Irwin Fridovich. *Emeritus Professor of Biochemistry, Duke University Medical Center, Durham, North Carolina.*

GENETICS AND HEREDITY (in part)

I.G. Isabella Gordon (d. 1988). *Head, Crustacea Section, British Museum (Natural History), London, 1928–66. Coeditor of Crustaceana.*

CRUSTACEANS (in part)

I.G.S. Irwin G. Sarason. *Professor of Psychology, University of Washington, Seattle. Author of Personality: An Objective Approach.*

PERSONALITY (in part)

I.Hr. Ivan Hrbek (d. 1993). *Staff member, Oriental Institute, Czechoslovak Academy of Sciences, Prague, 1953–92. Author of "The Chronology of Ibn Battute's Travels" in Archiv Orientalni.*

IBN BATTUTAH (Micropædia)

I.Hy. Isabelle Hyman. *Professor of Fine Arts, Washington Square and University College of Arts and Science, New York University, New York City.*

BRUNELLESCHI, FILIPPO (in part)

(Micropædia)

I.J. Ivar K. Johansson (d. 1988). *Professor of Animal Breeding, Agricultural College of Sweden, Uppsala. Author of Genetic Aspects of Dairy Cattle Breeding; coauthor of Genetics and Animal Breeding.*

FARMING AND AGRICULTURAL TECHNOLOGY (in part)

I.J.B. Ian J. Bickerton. *Senior Lecturer in History, University of New South Wales, Kensington, Australia. Coauthor of A Concise History of the Arab-Israeli Conflict and others.*

JORDAN (in part)

PALESTINE (in part)

I.J.G. Ignace J. Gelb (d. 1985). *Frank P. Hixon Distinguished Service Professor, Oriental Institute and Departments of Linguistics and of Near Eastern Languages and Civilizations, University of Chicago, 1965–79. Author of A Study of Writing and many others.*

LANGUAGES OF THE WORLD (in part)

LINGUISTICS (in part)

I.J.S. Irving J. Stolberg. *International consultant. Speaker of the House of Representatives of Connecticut, 1983–84*

and 1987–88; Connecticut State Representative, 1971–93. Assistant Professor of Geography, Southern Connecticut State College, New Haven, 1966–78.

UNITED STATES OF AMERICA (in part)

I.K. Irving Kaplansky. *Director Emeritus, Mathematical Sciences Research Institute, Berkeley, California. George Herbert Mead Distinguished Service Professor Emeritus of Mathematics, University of Chicago.*

Author of Commutative Rings.

GALOIS, ÉVARISTE (Micropædia)

HILBERT, DAVID (Micropædia)

I.K.P. Ismail K. Poonawala. *Professor of Arabic and Islāmic Studies, University of California, Los Angeles.*

ALI (Micropædia)

I.L.McC. Ivy Lilian McClelland. *Former Reader in Spanish, University of Glasgow, Scotland. Author of Tirso de Molina: Studies in Dramatic Realism and others.*

TIRSO DE MOLINA (Micropædia)

I.M.D. Igor Mikhailovich Diakonoff. *Chief scientific collaborator, Ancient Oriental Languages Group, Institute of Oriental Studies, Russian Academy of Sciences, St. Petersburg; former Head, Near Eastern Department. Author of Semito-Hamitic Languages and others.*

LANGUAGES OF THE WORLD (in part)

I.M.J. Ingrid Margareta Jonsson. *Staff Research Editor, Encyclopædia Britannica, Chicago, 1969–73.*

ATLANTIC OCEAN, THE (in part)

I.M.L. Ioan M. Lewis. *Emeritus Professor of Anthropology, London School of Economics and Political Science, University of London. Author of Blood and Bone: The Call of Kinship in Somali Culture and others.*

EASTERN AFRICA (in part)

OCCULTISM (in part)

I.M.P. do A. Ilídio Melo Peres do Amaral. *Professor of Geography, University of Lisbon. Rector, International University, Lisbon. Author of numerous publications on the geography of Portugal and its former colonies.*

PORTUGAL (in part)

I.M.S.S. Isbelia M. Sequera Tamayo. *Former President, National Academy of Economic Sciences, Caracas, Venezuela. Author of Venezuelan Economic Geography and others.*

VENEZUELA (in part)

I.N. Ivan Niven. *Emeritus Professor of Mathematics, University of Oregon, Eugene. Coauthor of Introduction to the Theory of Numbers and others.*

NUMBER THEORY (in part)

I.N.S. Ian Naismith Sneddon. *Emeritus Professor of Mathematics, University of Glasgow. Author of Elements of Partial Differential Equations and others.*

ANALYSIS (IN MATHEMATICS) (in part)

I.P. Indra Pal. *Professor of Geography, University of Rājasthān, Jaipur, India. Coauthor of World in Its Natural Regions.*

INDIA (in part)

- I.P.C.** Ioan Petru Culianu (d. 1991). *Visiting Professor of the History of Religions and the History of Christianity, University of Chicago. Author of Eros and Magic in the Renaissance.*
EUROPEAN RELIGIONS, ANCIENT (in part)
- I.P.G.** Innokentii Petrovich Gerasimov (d. 1985). *Director, Institute of Geography, Academy of Sciences of the U.S.S.R., Moscow. An authority on geomorphology and soil science.*
GEOMORPHIC PROCESSES (in part)
- I.P.H.** Ian P. Howard. *Professor of Psychology, York University, Toronto. Author of Human Visual Orientation.*
PERCEPTION, HUMAN (in part)
- I.P.S.** Ivan Peter Shaw. *Former Fellow and Secretary, King's College, University of London. Author of Nationality and the Western Church Before the Reformation.*
EDWARD THE BLACK PRINCE (Micropædia)
- I.R.C.** Ian R. Christie. *Astor Professor Emeritus of British History, University College, University of London. Author of Wilkes, Wyvill and Reform and others.*
WILKES, JOHN (Micropædia)
- Ir.W.** Irving Wallace (d. 1990). *Novelist and biographer. Author of The Fabulous Showman: The Life and Times of P.T. Barnum; The Man.*
BARNUM, P.T. (Micropædia)
- I.S.S.** Irvin S. Snyder. *Professor of Microbiology and Immunity, West Virginia University, Morgantown. Contributor to Modern Pharmacology.*
DRUGS AND DRUG ACTION (in part)
- I.St.** Ihor Stebelsky. *Professor of Geography, University of Windsor, Ontario. Coeditor of and contributor to Encyclopedia of Ukraine (5 vol.).*
UKRAINE (in part)
- I.Su.** Ilmari Sundblad. *Foreign Editor, Finnish News Agency (STT-FNB), Helsinki.*
FINLAND (in part)
- I.T.** Isadore Twersky. *Littauer Professor of Hebrew Literature and Philosophy, Harvard University. Author of Rabad of Posquières and others.*
RASHI (in part) (Micropædia)
- I.T.B.** Ivan T. Berend. *Professor of History, University of California, Los Angeles. Author of Central and Eastern Europe, 1944-93; Detour from the Periphery to the Periphery.*
HUNGARY (in part)
- I.T.R.** The Rt. Rev. Ian Thomas Ramsey (d. 1972). *Lord Bishop of Durham, England, 1966-72. Nolloth Professor of the Philosophy of Christian Religion, University of Oxford, 1951-66. Author of Religious Language; Christian Discourse.*
PHILOSOPHIES OF THE BRANCHES OF KNOWLEDGE (in part)
- I.V.H.** Ian Vernon Hogg. *Freelance writer. Editor, Jane's Infantry Weapons; Jane's Security and Counter-Insurgency Yearbook. Author of A History of Artillery; Illustrated Encyclopedia of Artillery.*
WAR, THE TECHNOLOGY OF (in part)
- I.V.N.** Israel Vladimirovich Nestyev. *Former Chief Scientist, Research Institute of History of Arts, Moscow. Author of Prokofiev.*
PROKOFIEV, SERGEY (in part) (Micropædia)
- I.V.P.** Igor Vladimirovich Popov (d. 1992). *Senior Scientist, State Hydrological Institute, St. Petersburg. Author of Basic Methods for the Study of Riverbed Processes.*
ASIA (in part)
- I.W.** Immanuel Wallerstein. *Distinguished Professor of Sociology, State University of New York at Binghamton. Author of Africa: The Politics of Independence.*
LUMUMBA, PATRICE (in part) (Micropædia)
- I.W.H.** Inez Whitaker Hunt (d. 1983). *Lecturer and freelance writer. Teacher of creative writing, University of Colorado extension, Colorado Springs, 1963-66. Coauthor of Lightning in His Hand: The Life Story of Nikola Tesla.*
TESLA, NIKOLA (Micropædia)
- I.Wo.** Isser Woloch. *Professor of History, Columbia University. Author of Jacobin Legacy: The Democratic Movement under the Directory and others.*
FRANCE (in part)
- I.Z.** Imre Zoltán, M.D. *Former Professor of Gynecology and Obstetrics, Semmelweis Medical University, Budapest, Hungary. Coauthor of Semmelweis élete és munkássága.*
SEMMELEWEIS, IGNAZ PHILIPP (Micropædia)
- J.A.A.** J.A. Andrups. *Author of Latvian Literature and others.*
LATVIAN LITERATURE (Micropædia)
- Ja.A.H.** James A. Hafner. *Professor of Geography; Director, Asian Studies Program, University of Massachusetts at Amherst. Author of Salt, Seasons and Sampons: Riverine Trade and Transport in Central Thailand and others.*
SOUTHEAST ASIA (in part)
- J.A.B.** James Alan Bassham. *Senior Scientist, Chemical Biodynamics Division, Lawrence Berkeley Laboratory, University of California, Berkeley, 1978-86; Research Chemist, 1949-77. Coauthor of Photosynthesis of Carbon Compounds; The Path of Carbon in Photosynthesis.*
PHOTOSYNTHESIS
- J.A.Bo.** John Andrew Boyle (d. 1978). *Professor of Persian Studies, Victoria University of Manchester, England, 1966-78. Editor of and contributor to Cambridge History of Iran (vol. 5).*
FERDOWSI (Micropædia)
GHĀZĀN, MAHMŪD (Micropædia)
- J.A.B.v.B.** J.A.B. van Buitenen (d. 1979). *Distinguished Service Professor of Sanskrit and Indic Studies, University of Chicago, 1974-79. Author of Tales of Ancient India.*
CALENDAR (in part)
HINDUISM (in part)
RĀMĀNUJA (Micropædia)
SOUTH ASIAN ARTS (in part)
- Ja.C.** Jan Christensen. *Assistant Foreign Editor, Verdens Gang, Oslo, Norway. Author of Kort om Stortinget.*
NORWAY (in part)
- J.A.C.** James A. Charles. *Emeritus Reader in Process Metallurgy, University of Cambridge. Coauthor of Selection and Use of Engineering Materials.*
INDUSTRIES, EXTRACTION AND PROCESSING (in part)
- J.A.Ca.** Jorge A. Camacho (d. 1989). *Freelance writer. Staff member, British Broadcasting Corporation, 1938-69; Head of Talks and Current Affairs (Radio), 1961-69.*
BROADCASTING (in part)
- J.A.C.A.** John Anthony Charles Ardagh. *Freelance writer and journalist. Author of France Today and others.*
PARIS (in part)
- J.A.C.B.** J.A.C. Brown (d. 1984). *Professor of Applied Economics, University of Oxford, 1970-84. Coauthor of The Lognormal Distribution.*
ECONOMIC THEORY (in part)
- J.A.Cr.** John Anthony Crook. *Professor of Ancient History, University of Cambridge, 1979-84. Author of Law and Life of Rome.*
MARCUS AURELIUS (Micropædia)
- Ja.D.** Janusz Durko. *Director, Historical Museum of Warsaw. Editor of Bibliography of Warsaw.*
WARSAW (in part)
- J.Ad.** Jean Adhémar (d. 1987). *Curator of Prints, Bibliothèque Nationale, Paris, 1961-87. Editor in Chief, Gazette des Beaux Arts, 1955-87. Author of Honoré Daumier and others.*
DAUMIER, HONORÉ (Micropædia)
- Ja.F.** James E. Faller. *Fellow, Joint Institute for Laboratory Astrophysics, University of Colorado, Boulder.*
GRAVITATION (in part)
- Ja.F.D.** Jane F. Desforges, M.D. *Distinguished Professor Emerita of Medicine, Tufts University, Boston.*
BLOOD (in part)
- J.A.G.** Jeffrey Allman Gritzner. *Professor of Geography; Director, Public Policy Research Institute, University of Montana, Missoula. Author of The West African Sahel: Human Agency and Environmental Change and others.*
AFRICA (in part)
- Ja.H.** Jay Higginbotham. *Archivist, Mobile Municipal Archives, Alabama. Author of Old Mobile: Fort Louis de la Louisiane, 1702-1711 and others.*
IBERVILLE (ET D'ARDILLIÈRES), PIERRE LE MOYNE D' (Micropædia)
- J.A.H.** John A. Haywood. *Reader in Arabic, University of Durham, England, 1967-78. Author of Arabic Lexicography.*
FAKHR AD-DIN AR-RĀZĪ (Micropædia)
JA'FAR IBN MUHAMMAD (Micropædia)
MAS'ŪDĪ, AL- (Micropædia)
- J.A.Ha.** John A. Harrison. *Emeritus Professor of History, University of Miami, Coral Gables, Florida. Editor, The Journal of Asian Studies, 1969-72. Author of New Light on Early and Medieval Japanese History.*
HŌJŌ FAMILY (Micropædia)

Ja.H.B. James H. Bready. *Former editorial writer and book columnist, The Sun newspapers, Baltimore, Maryland. Author of The Home Team.*

UNITED STATES OF AMERICA (in part)

Ja.Hi. Jane H. Hill. *Regents' Professor of Anthropology, University of Arizona, Tucson. Coauthor of Speaking Mexicano: Dynamics of Syncretic Language in Central Mexico; coeditor of Responsibility and Evidence in Oral Discourse.*

SOCIAL SCIENCES (in part)

J.A.Ho. James A. Hodges. *Professor of History, Wooster College, Wooster, Ohio.*

UNITED STATES OF AMERICA (in part)

Ja.J.P. James J. Parsons. *Emeritus Professor of Geography, University of California, Berkeley. Author of Antioqueño Colonization in Western Colombia.*

COLOMBIA (in part)

SOUTH AMERICA (in part)

Ja.J.S. James Joseph Stilwell. *Rear Admiral, U.S. Navy (retired). Labour arbitrator and consulting engineer.*

TRANSPORTATION (in part)

Ja.K. Jan Kazimour. *President, Federal Statistical Office of Czechoslovakia, Prague, 1969–81.*

PRAGUE (in part)

J.A.K. Jerzy A. Kondracki. *Emeritus Professor of Physical Geography, University of Warsaw. Author of Geografia fizyczna Polski.*

EUROPE (in part)

POLAND (in part)

J.A.Ka. John Anderson Kay. *Chairman, London Economics Ltd.; Professor of Economics, London Business School. Author of Foundations of Corporate Success; coauthor of The British Tax System and others.*

GOVERNMENT FINANCE (in part)

J.A.Ke. The Rev. John Arthur Kemp, S.J. (d. 1963). *Professor of Medieval History, Loyola University, Chicago, 1959–63. Author of History of Europe to 1500.*

ANSELM OF CANTERBURY, SAINT (Micropædia)

Ja.L. James Laver (d. 1975). *Keeper, Departments of Engraving, Illustration and Design, and of Paintings, Victoria and Albert Museum, London, 1938–59. Author of A Concise History of Costume.*

DRESS AND ADORNMENT (in part)

J.Al. John Allan (d. 1955). *Keeper, Department of Coins and Medals, British Museum, London, 1931–49.*

COINS AND COINAGE (in part)

J.A.L. Joseph Albert Lauwerys (d. 1981). *Director, Atlantic Institute of Education, Halifax, Nova Scotia, 1970–76. Professor of Comparative Education, University of London, 1947–70. Coeditor, World Year Book of Education, 1947–70.*

EDUCATION, HISTORY OF (in part)

Ja.La. Janko Lavrin (d. 1986). *Professor of Russian Literature, University of Nottingham, England, 1923–53. Author of Gogol; Russian Writers; and others.*

GOGOL, NIKOLAY (Micropædia)

Ja.L.S. Jason Lewis Saunders. *Former Professor of Philosophy, City College, City University of New York. Author of Early Stoic Philosophy.*

PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (in part)

Ja.M. Jacques Millot (d. 1980).

Professor, National Museum of Natural History, Paris, 1943–67. Researcher on the anatomy of coelacanths and their fossil relatives.

FISHES (in part)

J.A.M. John A. Marino. *Associate Professor of History, University of California, San Diego, at La Jolla. Author of Pastoral Economics in the Kingdom of Naples and others.*

ITALY (in part)

J.A.Ma. J. Alan Mackie. *Freelance writer.*

ALEXANDRIA (in part)

J.A.McG. Joseph A. McGeough. *Regius Professor of Engineering, University of Edinburgh. Author of Advanced Methods of Machining.*

TOOLS (in part)

J.A.M.K.I. Jozef A.M.K. IJsewijn. *Professor of Neo-Latin, Catholic University of Louvain, Belgium. Editor, Humanistica Lovaniensia.*

GROTIUS, HUGO (Micropædia)

J.A.Mn. J. Alden Mason (d. 1967). *Curator, American Section, University Museum, University of Pennsylvania, 1926–55.*

PERU (in part)

J.A.Mu. John A. Munroe. *H. Rodney Sharp Professor Emeritus of History, University of Delaware, Newark. Editor, Delaware History. Author of History of Delaware and others.*

UNITED STATES OF AMERICA (in part)

J.A.N. Jerry A. Nathanson. *Professor of Engineering, Union County College, Cranford, New Jersey. Author of Basic Environmental Technology: Water Supply, Waste Disposal, and Pollution Control.*

ENVIRONMENTAL ENGINEERING (Micropædia)

PUBLIC WORKS (in part)

J.A.P. James A. Peters (d. 1972). *Curator and Supervisor, Division of Reptiles and Amphibians, National Museum of Natural History, Smithsonian Institution, Washington, D.C., 1966–72. Specialist on the taxonomy of snakes.*

Author of Dictionary of Herpetology.

REPTILES (in part)

J.A.R. James Arthur Ramsay (d. 1988). *Professor of Comparative Physiology, University of Cambridge, 1969–76. Joint Editor, Journal of Experimental Biology, 1952–74. Author of Physiological Approach to the Lower Animals.*

EXCRETION AND EXCRETORY SYSTEMS (in part)

Ja.S. Jacques Soustelle (d. 1990). *Director of Studies, School of Advanced Studies in the Social Sciences, Paris, 1969–85. Author of La Vie quotidienne des Aztèques and others.*

PRE-COLUMBIAN CIVILIZATIONS (in part)

J.A.S. Jorge A. Suárez (d. 1985). *Professor of Amerindian Linguistics and of Contemporary Linguistics, National Autonomous University of Mexico, Mexico City. Coauthor of A Description of Colloquial Guaraní.*

LANGUAGES OF THE WORLD (in part)

Ja.Se. Jane Selverstone. *Associate Professor of Geology, Harvard University.*

MINERALS AND ROCKS (in part)

J.A.S.G. John A.S. Grenville. *Professorial Research Fellow, Institute of German Studies, University of Birmingham, England; former Professor of Modern History. Author of Lord Salisbury and Foreign Policy and others.*

SALISBURY, ROBERT CECIL, 3RD MARQUESS OF (Micropædia)

J.A.Sh. Jerome A. Shaffer. *Professor and Head, Department of Philosophy, University of Connecticut, Storrs. Author of Philosophy of Mind.*

MIND, THE PHILOSOPHY OF

J.A.T. John A. Thomas. *Vice President for Academic Services; Professor of Pharmacology, University of Texas Health Science Center at San Antonio. Coauthor of Principles of Endocrine Pharmacology and others.*

DRUGS AND DRUG ACTION (in part)

J.Au. Jeannine Auboyer (d. 1990). *Curator in Chief, Museum Guimet, Paris, 1965–80. Author of La Vie quotidienne dans l'Inde ancienne.*

rites and ceremonies, sacred (in part)

Ja.W. Jan Wojnowski. *Deputy Editor in Chief, Encyclopaedia, Polish Scientific Publishers PWN Ltd., Warsaw; Managing Editor, Nowa Encyklopedia Powszechna PWN.*

POLISH LITERATURE (in part)

J.A.W. Sir Jack Allan Westrup (d. 1975). *Professor of Music, University of Oxford, 1946–71; Fellow of Wadham College, Oxford, 1947–71. Author of Purcell and many others.*

MUSICAL INSTRUMENTS (in part)

PURCELL, HENRY (Micropædia)

J.A.Y. Jay A. Young. *Consultant on chemical safety and health. Manager, Technical Publications, Manufacturing Chemists Association, Washington, D.C., 1976–80. Hudson Professor of Chemistry, Auburn University, Alabama, 1970–75.*

CHEMICAL REACTIONS (in part)

J.B. Jonathan Barnes. *Professor of Ancient Philosophy, University of Geneva. Author of Aristotle; coeditor of Articles on Aristotle.*

PLATONISM, PLATO AND (in part)

J.Ba. Jacques Barzun. *University Professor Emeritus, Columbia University; Dean of Faculties and Provost, 1958–67. Author of Berlioz and the Romantic Century; Darwin, Marx, Wagner; and others.*

BERLIOZ, HECTOR (Micropædia)

EUROPEAN HISTORY AND CULTURE (in part)

FLAUBERT, GUSTAVE (in part) (Micropædia)

POE, EDGAR ALLAN (in part) (Micropædia)

J.B.A. John B. Allcock. *Head, Research Unit in South East European Studies,*

University of Bradford, England. Coeditor of Yugoslavia in Transition.

BALKAN STATES (in part)

BALKANS (Micropædia)

YUGOSLAVIA (Micropædia)

J.B.B. John Bernard Beer. Emeritus Fellow of Peterhouse, Cambridge; Emeritus Professor of English Literature, University of Cambridge. Author of Coleridge, the Visionary and others.

COLERIDGE, SAMUEL TAYLOR (in part)

(Micropædia)

ENGLISH LITERATURE (in part)

FORSTER, E.M. (Micropædia)

J.-B.Ba. Jean-Bertrand Barrère (d. 1985). Professor of French Literature, University of Cambridge, 1954–82; Fellow of St. John's College, Cambridge. Author of Hugo, l'homme et l'oeuvre and other works on Victor Hugo.

HUGO, VICTOR (in part) (Micropædia)

J.B.Bd. J. Brian Bird. Former Professor of Geography, McGill University, Montreal. Author of The Physiography of Arctic Canada and others.

ARCTIC, THE (in part)

J.B.B.T. John B.B. Trussell. Former Chief, Division of History, Pennsylvania Historical and Museum Commission, Harrisburg.

PHILADELPHIA (in part)

J.Be. Jeremy Bernstein. Professor of Physics, Stevens Institute of Technology, Hoboken, New Jersey. Author of Elementary Particles and Their Currents.

SCHRÖDINGER, ERWIN (in part)

(Micropædia)

YANG, CHEN NING (Micropædia)

J.B.F. John Bailey Fernald (d. 1985). Theatre director. Principal, Royal Academy of Dramatic Art, London, 1955–65. Professor of Dramatic Art, Oakland University, Rochester, Michigan, 1966–70. Author of Sense of Direction.

THEATRE, THE ART OF THE (in part)

J.B.Gl. Sir John Bagot Glubb (d. 1986). Lieutenant General; Chief of General Staff, The Arab Legion, Amman, Jordan, 1939–56. Author of War in the Desert and others.

ARABIA (in part)

IBN SA'UD (Micropædia)

MECCA AND MEDINA (in part)

J.B.He. James B. Hendrickson. Professor of Chemistry, Brandeis University, Waltham, Massachusetts. Author of The Molecules of Nature; coauthor of Organic Chemistry.

WOODWARD, R.B. (Micropædia)

J.B.Ho. Joseph Bixby Hoyt. Emeritus Professor of Geography, Southern Connecticut State College, New Haven. Author of The Connecticut Story.

UNITED STATES OF AMERICA (in part)

J.Bir. Jennifer Birkett. Professor of French Studies, University of Birmingham, England. Coauthor of A Guide to French Literature; coeditor of Samuel Beckett.

FRENCH LITERATURE (in part)

J.B.-J. John Buettner-Janusch (d. 1992). Professor and Chairman, Department of Anthropology, New York University, New

York City, 1973–79. Author of Origins of Man.

EVOLUTION, HUMAN (in part)

J.B.Mi. Jean Brown Mitchell (deceased). Fellow, Newnham College, Cambridge, 1934–68; Lecturer in Geography, University of Cambridge, 1945–68. Author of Historical Geography.

EUROPEAN OVERSEAS EXPLORATION AND EMPIRES, THE HISTORY OF (in part)

J.Bn. John Bryson (d. 1976). Fellow of Balliol College, University of Oxford.

ROSSETTI, CHRISTINA (in part) (Micropædia)

ROSSETTI, DANTE GABRIEL (in part)

(Micropædia)

ROSSETTI, GABRIELE (in part) (Micropædia)

J.Bo. James Bowen. Professor of Education, University of New England, Armidale, Australia. Author of A History of Western Education (3 vol.).

EDUCATION, HISTORY OF (in part)

J.B.P. J. Bruce Pluckhahn. Bowling historian. Former Curator, National Bowling Hall of Fame and Museum, St. Louis, Missouri. Coauthor of Pins and Needlers.

SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

J.B.R. Jeffrey Burton Russell. Professor of History, University of California, Santa Barbara. Author of A History of Heaven; Witchcraft in the Middle Ages.

OCCULTISM (in part)

J.B.Ra. John Bell Rae (d. 1988). Professor of the History of Technology, Harvey Mudd College, Claremont, California, 1959–76. Author of American Automobile Manufacturers: The First Forty Years and others.

INDUSTRIES, MANUFACTURING (in part)

J.Bru. Jean Bruhat. Former Professor, Institute of Political Science of Paris. Former Instructor, University of Paris VIII. Author of Les Journées de février 1848 and others.

BLANQUI, AUGUSTE (Micropædia)

J.B.S. John B. Sender. Professor of Political Economy, University of the Witwatersrand, Johannesburg. Head, Department of Economics, School of Oriental and African Studies, University of London. Coauthor of The Development of Capitalism in Africa.

SOUTHERN AFRICA (in part)

J.B.Sm. J(enkyn) Beverley Smith. Professor of Welsh History, University College of Wales, Aberystwyth, University of Wales. Author of Llywelyn ap Gruffydd, Tywysog Cymru.

UNITED KINGDOM (in part)

J.B.Sp. J. Brookes Spencer. Associate Professor Emeritus of the History of Science, Oregon State University, Corvallis. Editor of The Collected Works of Niels Bohr.

PHYSICAL SCIENCES, THE (in part)

J.B.St. J.B. Stothers. Professor of Chemistry, University of Western Ontario, London. Author of Carbon-13 NMR Spectroscopy.

CHEMICAL COMPOUNDS (in part)

J.Bt. Jean Bonnerot (deceased). Literary scholar and critic. Editor of Correspondance Générale de Sainte-Beuve. SAINTE-BEUVE, CHARLES-AUGUSTIN (in part) (Micropædia)

J.Bu. Joseph Buttinger (d. 1992). Freelance writer. Author of Vietnam: A Dragon Embattled and others.

SOUTHEAST ASIA (in part)

J.B.W. John B. Woodward. Professor of Naval Architecture and Marine Engineering, University of Michigan, Ann Arbor. Author of Low Speed Marine Diesel and many others.

TRANSPORTATION (in part)

J.C. Jill Crystal. Assistant Professor of Political Science, University of Michigan, Ann Arbor. Author of Oil and Politics in the Gulf and others.

ARABIA (in part)

J.Ca. José Costa. Professor of Pathology and Biology, Yale University School of Medicine, New Haven, Connecticut.

CANCER

J.C.B. Jon Charles Barlow. Curator, Department of Ornithology, Royal Ontario Museum, Toronto. Professor of Zoology; Director, Museum Studies Program, University of Toronto. Researcher of the biology and taxonomy of vireos. Author of "Xenarthrans and Pholidotes" in Recent Mammals of the World.

MAMMALS (in part)

J.C.Be. The Rev. John C. Bennett (d. 1995). President, Union Theological Seminary, New York City, 1963–70. Chairman, Editorial Board, Christianity and Crisis, 1960–70. Author of Christians and the State.

NIEBUHR, REINHOLD (Micropædia)

J.C.D. John C. Dewdney. Emeritus Professor of Geography, University of Durham, England. Author of A Geography of the Soviet Union; Turkey; and others.

RUSSIA (in part)

TURKEY AND ANCIENT ANATOLIA (in part)

UNION OF SOVIET SOCIALIST REPUBLICS

(in part)

J.C. de C. Jacques Chastenot de Castaing (d. 1978). Historian and journalist. Member of the French Academy. Author of Léon Gambetta and others.

GAMBETTA, LÉON (Micropædia)

J.C. de G.-J. John Coleman de Graft-Johnson (d. 1977). Editor, Economic Bulletin of Ghana. Research Associate Professor of Economics, University of Ghana. Author of African Glory: The Story of Vanished Negro Civilizations.

MŪSĀ (Micropædia)

J.C.F. Jean Claude Froelich (d. 1972). Director, Center for Advanced Studies on Modern Africa and Asia, University of Paris. Author of Les Musulmans d'Afrique noire; "al-Hādjdj 'Umar b. Sa'īd b. 'Uthmān Tāl" in The Encyclopedia of Islam.

'UMAR TĀL (in part) (Micropædia)

J.C.G. John Charles Godbey. Professor of Church History, Meadville/Lombard Theological School, Chicago.

PROTESTANTISM (in part)

J.C.Gi. J. Calvin Giddings. *Distinguished Professor of Chemistry, University of Utah, Salt Lake City. Author of Dynamics of Chromatography and others.*

ANALYSIS AND MEASUREMENT, PHYSICAL AND CHEMICAL (in part)

J.C.Gr. Jerald C. Graue (d. 1982). *Associate Professor of Musicology and Music History, Eastman School of Music, University of Rochester, New York. Music, THE ART OF* (in part)

J.Ch. John Cherry. *Deputy Keeper, Department of Medieval and Later Antiquities, British Museum, London. HISTORY, THE STUDY OF* (in part)

J.C.H. J.C. Holt. *Emeritus Professor of Medieval History, University of Cambridge. Author of King John and others.*

JOHN (ENGLAND) (Micropædia)

J.C.J.M. John Callan James Metford. *Emeritus Professor of Spanish, University of Bristol, England. Author of San Martín the Liberator and others.*

SAN MARTÍN, JOSÉ DE (Micropædia)

J.C.K. John C. Krantz, Jr. (d. 1983). *Professor of Pharmacology, University of Maryland, Baltimore, 1935–65. Coauthor of Pharmacologic Principles of Medical Practice.*

MEDICINE (in part)

J.C.Ki. Joseph C. Kiger. *Director, Program on Foundations and Comparable Organizations, University of Mississippi, University. Author of American Learned Societies; Historiographic Review of Foundation Literature; editor of International Encyclopedia of Foundations.*

PHILANTHROPIC FOUNDATIONS (Micropædia)

J.C.L. Joseph Collins Lawrence. *Former Assistant Professor of History, University of British Columbia, Vancouver. Author of A Brief History of Sooke and District.*

CANADA (in part)

J.C.Lo. John Christopher Lovell. *Senior Lecturer in Economic and Social History, University of Kent at Canterbury, England. Author of British Trade Unions 1875–1933 and others.*

WORK AND EMPLOYMENT (in part)

J.C.M. Joseph C. Miller. *T. Cary Johnson, Jr., Professor of History, University of Virginia. Author of Way of Death: Merchant Capitalism and the Angolan Slave Trade, 1730–1830; coeditor of Macmillan Encyclopedia of World Slavery; compiler of Slavery and Slaving in World History: A Bibliography.*

SLAVERY (in part)

J.C.Mi. James Clyde Mitchell. *Official Fellow of Nuffield College, University of Oxford. Professor of Urban Sociology, Victoria University of Manchester, England, 1966–74.*

SOUTHERN AFRICA (in part)

J.Co. Jean L. Comhaire (d. 1994). *Professor of Social Anthropology, University of Juba, The Sudan. Sociologist, United Nations Economic Commission for*

Africa. Author of Urban Administration in Africa and others.

WESTERN AFRICA (in part)

J.C.O. John C. Ogden. *Director, Florida Institute of Oceanography, St. Petersburg. Professor of Biology, University of South Florida, Tampa.*

ATLANTIC OCEAN, THE (in part)

J.Cr. John Cruickshank (d. 1995). *Emeritus Professor of French, University of Sussex, Brighton, England, 1962–89. Author of Albert Camus and the Literature of Revolt and others; editor of French Literature and Its Background.*

CAMUS, ALBERT (Micropædia)

J.C.-R. Jules-Marie Chaix-Ruy. *Professor of Philosophy, University of Nice, France, 1965–67. Author of J.-B. Vico et l'illuminisme athée; Vie de J.-B. Vico.*

VICO, GIAMBATTISTA (Micropædia)

J.C.Rd. John Cowie Reid (d. 1972). *Professor of English, University of Auckland, New Zealand. Author of Mind and Art of Coventry Patmore; Francis Thompson: Man and Poet; and others.*

HOPKINS, GERARD MANLEY (Micropædia)

J.C.Re. John C. Reilly, Jr. *Historian, Naval History Division, Office of the Chief of Naval Operations, U.S. Department of the Navy, Washington, D.C. Coauthor of Capital Ships: A Handbook of United States Battleships and Battle Cruisers 1896–1969.*

WAR, THE TECHNOLOGY OF (in part)

J.C.Ry. J. Coert Rylaarsdam. *Emeritus Professor of Old Testament Theology, University of Chicago. Emeritus Professor of Theology, Marquette University, Milwaukee. Author of Revelation in Jewish Wisdom Literature.*

BIBLICAL LITERATURE AND ITS CRITICAL INTERPRETATION (in part)

DAVID (ISRAEL) (Micropædia)

J.C.S. James C. Spalding (d. 1996). *Professor of Religion, University of Iowa, Iowa City. Editor of The Reformation of the Ecclesiastical Laws of England, 1552.*

PROTESTANTISM (in part)

J.C.Sa. John C. Sainsbury. *Professor and Head, Department of Oceanography and Ocean Engineering, Florida Institute of Technology, Melbourne. Author of Commercial Fishing Methods: An Introduction to Vessels and Gears.*

FISHING, COMMERCIAL (in part)

J.C.T. James Chase Tyler. *Senior Scientist, National Museum of Natural History, Smithsonian Institution, Washington, D.C. Author of Osteology, Phylogeny, and Higher Classification of the Fishes of the Order Plectognathi (Tetraodontiformes).*

FISHES (in part)

J.C.Ta. John Campbell Taylor. *President, Jan H. Reimers and Associates Inc. (metallurgical consulting engineers), Oakville, Ontario. Editor of or contributor to numerous papers on extraction, smelting, by-product recovery, plant safety, and environmental issues related to metallurgy.*

INDUSTRIES, EXTRACTION AND PROCESSING (in part)

J.Cul. James Cullen. *Director, Stanley Smith Horticultural Trust. Coauthor of The Identification of Flowering Plant Families.*

ANGIOSPERMS (in part)

J.C.V. J. Charles Verlinden. *Emeritus Professor of History, State University of Ghent. Director, Belgian Historical Institute, Rome, 1955–86. Author of En Flandre sous Philippe II and others.*

BELGIUM (in part)

J.D.A. Jean Daniel Anthony. *Professor, Laboratory of Comparative Anatomy, National Museum of Natural History, Paris. Coauthor of Anatomie de Latimeria Chalumnae.*

FISHES (in part)

J.D.Ad. Jeremy D. Adler. *Professor of German, King's College, University of London.*

GERMAN LITERATURE (in part)

J.D.An. John Duke Anthony. *President, National Council on U.S.-Arab Relations, Washington, D.C. Author of The Sultanate of Oman and the Emirates of Eastern Arabia and others.*

ARABIA (in part)

J.D.B. John D. Bell. *Professor of History, University of Maryland, Baltimore County, Baltimore. Author of The Bulgarian Communist Party from Blagoev to Zhivkov and others.*

BALKAN STATES (in part)

J.D.Bu. James D. Burke. *Member, Technical Staff, Spacecraft Systems Engineering, Jet Propulsion Laboratory, California Institute of Technology, Pasadena. Technical Editor, The Planetary Report.*

SOLAR SYSTEM, THE (in part)

J.D.C. Jesse Dunsmore Clarkson (d. 1973). *Professor of History, Brooklyn College, City University of New York, 1945–67. Author of A History of Russia.*

SPIERANSKY, MIKHAIL MIKHAYLOVICH, GRAF (Micropædia)

J.D.Co. James Daniel Collins (d. 1985). *Professor of Philosophy, St. Louis University, Missouri. Author of The Emergence of Philosophy of Religion.*

THOMISM, THOMAS AQUINAS AND (in part)

J.D.F. John D. Fage. *Emeritus Professor of African History, University of Birmingham, England; Pro-Vice-Chancellor, 1979–84; Vice-Principal, 1981–84. Author of A History of Africa and others.*

WESTERN AFRICA (in part)

J.D.G. Jack D. Graybeal. *Professor and Associate Head, Department of Chemistry, Virginia Polytechnic Institute and State University, Blacksburg. Author of Molecular Spectroscopy.*

ANALYSIS AND MEASUREMENT, PHYSICAL AND CHEMICAL (in part)

J.D.-G. Jacques Duchesne-Guillemin. *Emeritus Professor of Indo-Iranian Studies, University of Liège, Belgium. Author of The Religion of Ancient Iran and others.*

ZOROASTRIANISM AND PARSIISM

J.D.H. John D. Hargreaves. *Emeritus Professor of History, University of*

Aberdeen, Scotland. Author of Decolonization in Africa and others.
WESTERN AFRICA (in part)

J.Di. James Dickie. Lecturer in Islāmic Studies, University of Lancaster, England, 1969–74. Editor of *Diwān Ibn Shuhaid al-Andalusi*.

rites and ceremonies, sacred (in part)

J.D.K. John D. Kesby. Lecturer in Social Anthropology, University of Kent at Canterbury, England. Author of *The Cultural Regions of East Africa*.
EASTERN AFRICA (in part)

J.D.L. John David Legge. Emeritus Professor of History, Monash University, Clayton, Australia; Dean, Faculty of Arts, 1978–86. Author of *Intellectuals and Nationalism in Indonesia*.
INDONESIA (in part)

J.D.M. Jürgen D. Moltmann. Professor of Systematic Theology, Eberhard Karl University of Tübingen, Germany. Author of *Theology of Hope and others*.
DOCTRINES AND DOGMAS, RELIGIOUS (in part)

J.D.Ma. John D. Martz. Distinguished Professor of Political Science, Pennsylvania State University, University Park. Author of *Acción Democrática: Evolution of a Modern Political Party in Venezuela and others*.
VENEZUELA (in part)

J.D.Mo. Janet D. Momsen. Professor of Geography, University of California, Davis. Editor of *Women and Change in the Caribbean*.
WEST INDIES, THE (in part)

J.D.O. Jerome David Odom. Professor of Chemistry, University of South Carolina, Columbia. Coauthor of *Chemistry: Concepts and Models*.
CHEMICAL COMPOUNDS (in part)

J.D.Pr. John Douglas Pringle. Editor, *Sydney Morning Herald*, 1952–57 and 1965–70. Author of *Australian Accent*.
AUSTRALIA (in part)
SYDNEY (in part)

J.D.Pro. Jules David Prown. Paul Mellon Professor of the History of Art, Yale University. Author of *American Painting from Its Beginnings to the Armory Show and others*.
EAKINS, THOMAS (Micropædia)
HOMER, WINSLOW (Micropædia)

J.D.R. John D. Ryder (d. 1993). Professor of Electrical Engineering, Michigan State University, East Lansing, 1968–72. Author of *Engineering Electronics and others*.
ENGINEERING (in part)

J.D.Ri. John David Rickard. Reader in History, Monash University, Clayton, Victoria, Australia. Author of *Australia: A Cultural History and others*.
AUSTRALIA (in part)

J.D.Ro. Jack D. Rollin. Soccer Columnist, *Sunday Telegraph*, London. Editor, *Rothmans Football Yearbook*. Author of *The Guinness Book of Soccer Facts & Feats and others*.
SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

J.D.S. James Duane Squires (d. 1981). Professor of History, Colby-Sawyer College, New London, New Hampshire, 1933–70. Chairman, New Hampshire American Revolution Bicentennial Commission. Member, Governor's Task Force for Study of New Hampshire, 1970.
UNITED STATES OF AMERICA (in part)

J.D.Sc. John D. Schmidt. Assistant Professor of History, Columbia University.
CALENDAR (in part)

J.D.Sm. James Desmond Smyth. Emeritus Professor of Parasitology, London School of Hygiene and Tropical Medicine, University of London. Author of *Introduction to Animal Parasitology*.
FLATWORMS

J.D.T. James D. Tracy. Professor of History, University of Minnesota, Minneapolis. Author of *Erasmus: The Growth of a Mind and others*.
ERASMUS

J.D.V. John D. Venables. President, Venables & Assoc. (aerospace materials consultants), Towson, Maryland. Author of numerous papers dealing with materials science.
MATERIALS SCIENCE (in part)

J.D.W. John D. Weaver. Freelance writer. Author of *Los Angeles: The Enormous Village; The Brownsville Raid; and others*.
LOS ANGELES

J.E. Jens Engberg. Professor of History, University of Aarhus, Denmark. Author of *Det slesvigske spørgsmål 1850–1853 and others*.
CHRISTIAN IV (DENMARK) (Micropædia)

Je.B. Jean Bouvier (d. 1987). Professor of Economics, University of Paris I. Author of *Les Rothschild and others*.
ROTHSCHILD FAMILY (Micropædia)
TURGOT, ANNE-ROBERT-JAQUES, BARON DE L'AULNE (Micropædia)

J.E.B. John Edward Bowle (d. 1985). Professor of Political Theory, College of Europe, Brugge, Belgium, 1950–67. Author of *Politics and Opinion in the 19th Century*.
POLITICAL PHILOSOPHY, THE HISTORY OF WESTERN

J.E.Bu. John Everett Butt (d. 1965). Regius Professor of Rhetoric and English Literature, University of Edinburgh, 1959–65. Author of *Pope's Poetical Manuscripts; coeditor of Letters of Alexander Pope and others*.
POPE, ALEXANDER (in part) (Micropædia)

Je.C. Jean Cousin (deceased). Professor of Latin Language and Literature, University of Besançon, France. Author of *Destin de Rome and others*.
DIOCLETIAN (Micropædia)

J.E.C. John E. Carruthers. Assistant General Manager, Refineries Department, British Petroleum Company Ltd., London, 1964–69.
INDUSTRIES, EXTRACTION AND PROCESSING (in part)

J.E.Ca. James Edward Canright. Emeritus Professor of Botany, Arizona

State University, Tempe. Author of *Fossil Plants of Indiana*.
ANGIOSPERMS (in part)

Je.Ch. Jerome Ch'en. Emeritus Professor of East Asian History, York University, Toronto. Author of *Yuan Shih-k'ai, 1859–1916*.
YÜAN SHIH-K'AI (Micropædia)

J.E.C.H. J.E. Christopher Hill. Master of Balliol College, University of Oxford, 1965–78. Author of *Intellectual Origins of the English Revolution and others*.
PYM, JOHN (Micropædia)

J.E.Co. J.E. Coates (d. 1973). Professor of Chemistry, University College of Swansea, University of Wales, 1920–48. Author of *The Chemical Society memorial lecture on Haber*.
HABER, FRITZ (Micropædia)

J.E.C.W. J.E. Caerwyn Williams. Emeritus Professor of Irish, University College of Wales, Aberystwyth, University of Wales; Director, Centre for Advanced Welsh and Celtic Studies, 1979–85. Consultant Editor, *Studia Celtica* (annual). Author of *The Poets of the Welsh Princes and others*.
CELTIC LITERATURE (in part)

Je.D. Jean Dresch (deceased). Professor of Geography, University of Paris VII, 1948–77. Author of *Recherches sur l'évolution du relief dans le Haut-Atlas*.
MADAGASCAR (in part)

J.E.E. John E. Englekirk (deceased). Professor of Spanish and Portuguese, University of California, Los Angeles, 1958–73. Author of *Poe in Hispanic Literature; coauthor of La narrativa uruguaya*.
LATIN-AMERICAN LITERATURE (in part)

J.E.Ec. James Emory Eckenwalder. Associate Professor of Botany, University of Toronto.
GYMNOSPERMS (in part)

J.E.F. John E. Fagg. Emeritus Professor of History, New York University, New York City. Author of *Cuba, Haiti, and the Dominican Republic and others*.
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J.E.H. Joseph E. Hawkins. Emeritus Professor of Otolaryngology (Physiological Acoustics), Medical School, University of Michigan, Ann Arbor. Editor of *Otophysiology*.
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J.E.He. Judith Eleanor Herrin. Stanley J. Seeger Professor of Byzantine History, Princeton University. Author of *The Formation of Christendom; editor of Constantinople in the Early Eighth Century*.
EUROPEAN HISTORY AND CULTURE (in part)

Je.Ho. Jerome Holtzman. Baseball columnist, *Chicago Tribune*. Elected to the *Writers' Wing, National Baseball Hall of Fame*, 1990. Coauthor of *Three and Two; editor of No Cheering in the Press Box; Fielder's Choice*.
SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

- J.E.Ho. James Edward Hoffmann.** *President, Jan H. Reimers and Associates USA Co. (metallurgical consulting engineers), Houston, Texas. Coeditor of the proceedings of The Reinhardt Schumann International Symposium on Innovative Technology and Reactor Design in Extraction Metallurgy.*
INDUSTRIES, EXTRACTION AND PROCESSING (in part)
- J.E.Hr. J. Edgar Hoover** (d. 1972). *Director, Federal Bureau of Investigation, U.S. Department of Justice, Washington, D.C., 1924–72.*
FINGERPRINT (in part) (Micropædia)
- J.E.K. Joel E. Keizer.** *Professor of Chemistry and Director, Institute of Theoretical Dynamics, University of California, Davis. Author of Statistical Thermodynamics of Nonequilibrium Processes.*
THERMODYNAMICS, PRINCIPLES OF (in part)
- Je.M. Jean Mitry** (d. 1988). *Professor and Director, Cinema Division, Institute of Art and Archaeology, University of Paris I. Author of Esthétique et psychologie du cinéma; Histoire du cinéma; S.M. Eisenstein; and others.*
EISENSTEIN, SERGEY (Micropædia)
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ECHINODERMS (in part)
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EUROPE (in part)
- J.E.P. J.E. Peterson.** *Historian, Office of the Deputy Prime Minister for Security and Defence, Muscat, Oman. Author of Oman in the Twentieth Century and others.*
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AFRICA (in part)
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BRANCUSI, CONSTANTIN (Micropædia)
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COMENIUS, JOHN AMOS (Micropædia)
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INDIA (in part)
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CHINA (in part)
EAST ASIAN ARTS (in part)
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- J.E.Sn. James E. Snyder** (d. 1990). *Professor of Art History, Bryn Mawr College, Pennsylvania. Author of Northern Renaissance Art and others.*
MEMLING, HANS (Micropædia)
- Je.St. Jerry Stannard** (d. 1988). *Professor of History, University of Kansas, Lawrence, 1967–88.*
PLINY THE ELDER (Micropædia)
- J.Ev. Dame Joan Evans** (d. 1977). *President, Society of Antiquaries, London, 1959–64. Author of John Ruskin and many others.*
RUSKIN, JOHN (in part) (Micropædia)
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TRANSPORTATION (in part)
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FOUCAULT, MICHEL (Micropædia)
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WESTERN AFRICA (in part)
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NUTRITION (in part)
- J.F.Br. John Fleetwood Baker, Baron Baker** (d. 1985). *Professor of Mechanical Sciences, University of Cambridge, 1943–68; Fellow of Clare College, Cambridge. Author of Differential Equations of Engineering Science and others; coauthor of The Analysis of Engineering Structures.*
ENGINEERING (in part)
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FRANCE (in part)
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GREEK AND ROMAN CIVILIZATIONS, ANCIENT (in part)
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UNITED NATIONS (in part)
- J.F.G. John F. Guilmartin, Jr.** *Associate Professor of History, Ohio State University, Columbus. Author of Gunpowder and Galleys: Changing Technology and Mediterranean Warfare at Sea in the Sixteenth Century.*
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J.F.H. John Frederick Haldon. *Reader in Byzantine Studies, University of Birmingham, England. Author of Byzantium in the Seventh Century and others.*

GREECE (in part)

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J.F.Ha. John F. Hayward (d. 1983). *Associate Director, Sotheby Parke-Bernet and Company, London and New York City. Deputy Keeper, Victoria and Albert Museum, London, 1946–65. Author of Virtuoso Goldsmiths and others.*

DECORATIVE ARTS AND FURNISHINGS (in part)

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CONSTANTINE THE GREAT (in part)

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CZECH AND SLOVAK REPUBLICS (in part)

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SPAIN (in part)

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Architectural Forms for an American Society.

RICHARDSON, HENRY HOBSON (Micropædia)

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PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (in part)

J.F.Q. John Francis Quinn. *Professor of Philosophy, Pontifical Institute of Mediaeval Studies, Toronto. Author of "The Historical Constitution of St. Bonaventure's Philosophy," in Medieval Texts and Studies.*

BONAVENTURE, SAINT (Micropædia)

J.Fr. Joseph Frankel (d. 1989). *Professor of Politics, University of Southampton, England, 1963–78. Author of The Making of Foreign Policy and others.*

WAR, THE THEORY AND CONDUCT OF (in part)

J.F.S. Joseph Frederick Scott (d. 1971). *Vice-Principal; Principal Lecturer in Mathematics, St. Mary's College, Strawberry Hill, England. Author of A History of Mathematics.*

NAPIER, JOHN (Micropædia)

J.F.Sk. John Francis Skone, M.D. *Former Honorary Lecturer in Epidemiology and Community Medicine, University of Wales College of Medicine, Cardiff.*

MEDICINE (in part)

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FLORENCE (in part)

ITALY (in part)

MILAN (in part)

ROME (in part)

VENICE (in part)

J.F.W. J. Fred Weston. *Emeritus Professor of Managerial Economics and Finance, University of California, Los Angeles. Author of The Scope and Methodology of Finance and others.*

BUSINESS ORGANIZATION (in part)

J.G. Joseph Gentili. *Honorary Research Fellow, University of Western Australia, Nedlands; former Reader in Geography. Author of Climates of Australia and New Zealand and others.*

CLIMATE AND WEATHER (in part)

J.G.A. James G. Ashbaugh. *Emeritus Professor of Geography, Portland State University, Oregon. Author of A Geography of the Columbia River Ports.*

NORTH AMERICA (in part)

J.G.B. J. Guthrie Brown (d. 1976). *Senior Consultant, Sir Alexander Gibb & Partners, Consulting Engineers. President, International Commission on Large Dams, 1964–67. Coauthor of Power from Water.*

PUBLIC WORKS (in part)

J.G.Cr. J.G. Crowther (d. 1983). *Author of Famous American Men of Science; Science in Modern Society; and many others.*

GIBBS, J. WILLARD (Micropædia)

J.Ge. John Gergely, M.D. *Director, Department of Muscle Research, Boston Biomedical Research Institute. Biochemist, Massachusetts General Hospital, Boston. Associate Professor of Biological Chemistry, Harvard University.*

MUSCLES AND MUSCLE SYSTEMS (in part)

J.G.G. John G. Gallaheer. *Professor of History, Southern Illinois University at Edwardsville. Author of "Leo X" in New Catholic Encyclopedia.*

LEO X (PAPACY) (Micropædia)

J.G.H. John G. Hargrave (d. 1982). *Author of The Life and Soul of Paracelsus and others.*

PARACELSUS (Micropædia)

J.Gi. The Rev. Joseph Gill, S.J. (d. 1989). *Professor of Byzantine Greek Language and of Byzantine History, Pontifical Oriental Institute, Rome, 1946–67. Author of The Council of Florence and others.*

NICHOLAS V (PAPACY) (Micropædia)

PIUS II (Micropædia)

J.Gl. James Gleick. *Science writer, The New York Times, 1986–88. Author of Genius: The Life and Science of Richard Feynman and others.*

FEYNMAN, RICHARD P. (Micropædia)

J.G.M. J. Gordon Melton. *Director, Institute for the Study of American Religion, Santa Barbara, California. Author of La Chiesa di Scientology; editor of Encyclopedia of American Religions and others.*

AUM SHINRIKYO (Micropædia)

BRANCH DAVIDIAN (Micropædia)

CHRISTIAN SCIENCE (Micropædia)

CHURCH UNIVERSAL (Micropædia)

ECKANKAR (Micropædia)

EVANGELICAL CHURCH (Micropædia)

FAMILY, THE (Micropædia)

HARE KRISHNA (Micropædia)

HEAVEN'S GATE (Micropædia)

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NEW AGE MOVEMENT (Micropædia)

PENTECOSTALISM (Micropædia)

PEOPLE'S TEMPLE (Micropædia)

SCIENTOLOGY (Micropædia)

WICCA (Micropædia)

J.G.Me. John G. Merrills. *Professor of International Law, University of Sheffield, United Kingdom. Coauthor of Human Rights in Europe: A Study of the European Convention on Human Rights and others.*

EUROPEAN COURT OF HUMAN RIGHTS

(Micropædia)

J.Go. Jacques Godechot (d. 1989). *Professor of Modern and Contemporary History, 1945–80; Dean, Faculty of Letters, University of Toulouse II, France, 1961–71. Author of Les Révolutions, 1770–1799; Napoléon; and others.*

NAPOLEON

TALLEYRAND, CHARLES-MAURICE DE, PRINCE DE BENEVENT (in part) (Micropædia)

J.Gol. Judah Goldin. *Emeritus Professor of Post-Biblical Hebrew Literature,*

University of Pennsylvania, Philadelphia.
Author of The Fathers According to Rabbi Nathan and others.

HILLEL (in part) (Micropædia)

JOHANAN BEN ZAKKAI (Micropædia)

J.G.P. John Graham Pollard. *Former Deputy Director and Keeper, Department of Coins and Medals, Fitzwilliam Museum, University of Cambridge. Coeditor of Renaissance Medals from the Samuel H. Kress Collection at the National Gallery.*
 COINS AND COINAGE (in part)

J.Gre. James Green. *Emeritus Professor of Zoology, Queen Mary and Westfield College, University of London. Author of The Biology of Estuarine Animals.*
 CRUSTACEANS (in part)

J.Gt. Jean Guiart. *Professor of Ethnology, Museum of Man, National Museum of Natural History, Paris. Author of Oceania.*

OCEANIC ARTS (in part)

J.G.Th. John Gareth Thomas (d. 1987). *Registrar, University of Wales, Cardiff. Coauthor of Wales.*

UNITED KINGDOM (in part)

J.G.W. J. Garth Watson (d. 1992). *Secretary, Institution of Civil Engineers, London, 1967–79.*

ENGINEERING (in part)

J.H. Jakob Houtgast (d. 1981). *Associate Professor of Astronomy, Astronomical Institute, State University of Utrecht, The Netherlands. Coauthor of Photometric Atlas of the Solar Spectrum.*

ECLIPSE, OCCULTATION, AND TRANSIT (in part)

J.Ha. Jack Halpern. *Louis Block Distinguished Service Professor of Chemistry, University of Chicago. Author of papers on coordination compounds and reaction mechanisms.*

CHEMICAL COMPOUNDS (in part)

J.H.A.J. Jörg H.A. Janzen. *Academic counselor, Centre for Development Studies, Faculty of Geosciences, Free University of Berlin. Author of Nomads in the Sultanate of Oman.*

EASTERN AFRICA (in part)

J.H.B. James H. Bater. *Professor of Geography, University of Waterloo, Ontario. Author of Russia and the Post-Soviet Scene: A Geographical Perspective and others.*

BALTIC STATES (in part)

J.-H.B. Jacques-Henry Bornecque. *Professor of Modern and Contemporary French Literature, University of Paris XIII. Author of Les Années d'apprentissage d'Alphonse Daudet; Verlaine par lui-même; and others.*

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J.H.Be. John Herbert Beynon. *Royal Society Research Professor Emeritus, University College of Swansea, University of Wales. Author of Mass Spectrometry and Its Application to Organic Chemistry.*

ANALYSIS AND MEASUREMENT, PHYSICAL AND CHEMICAL (in part)

J.H.Bo. John H. Bounds. *Professor of Geography, Sam Houston State University, Huntsville, Texas. Author of Tahiti.*

WEST INDIES, THE (in part)

J.H.Br. John H. Bryant, M.D. *Professor and Chairman, Department of Community Health Sciences, Aga Khan University, Karachi, Pakistan. Author of Health and the Developing World.*

MEDICINE (in part)

J.H.D. James H. Downing. *Metallurgical consultant. Senior Fellow, Elkem Metals, Niagara Falls, New York, 1986–91.*

INDUSTRIES, EXTRACTION AND PROCESSING (in part)

J.He. John Herivel. *Former Reader in the History and Philosophy of Science, Queen's University of Belfast, Northern Ireland. Author of The Background to Newton's Principia.*

HUYGENS, CHRISTIAAN (Micropædia)

J.H.H. John H. Holmes. *Professor of Geography, University of Queensland, Brisbane. Editor of Queensland: A Geographical Interpretation; coeditor of Settlement Systems in Sparsely Populated Regions.*

AUSTRALIA (in part)

J.H.-H. John Heslop-Harrison. *Royal Society Research Professor, University College of Wales, Aberystwyth, University of Wales, 1977–85. Director, Royal Botanic Gardens, Kew, England, 1971–77. Author of numerous papers on development in plants.*

GROWTH AND DEVELOPMENT, BIOLOGICAL (in part)

J.H.Hi. John Hugh Hill. *Emeritus Professor of Medieval History, University of Houston, Texas. Coauthor of Raymond IV, Count of Toulouse and others.*

BOHEMOND I (in part) (Micropædia)

J.H.Hy. John H. Humphrey, M.D. (d. 1987). *Professor of Immunology, Royal Postgraduate Medical School, University of London, 1976–81. Coeditor of Advances in Immunology.*

IMMUNITY

J.Hi. John Hick. *Danforth Professor Emeritus of the Philosophy of Religion, Claremont Graduate School, California. Author of Death and Eternal Life and others.*

CHRISTIANITY (in part)

J.H.J. John Holmes Jellett (d. 1971). *Civil engineer. Director, Anglo Dutch Dredging Company Ltd., Beaconsfield, England. Docks engineer, Southampton, England, 1946–66.*

PUBLIC WORKS (in part)

J.H.Ja. Jay H. Jasanoff. *Jacob Gould Schurman Professor of Linguistics, Cornell University, Ithaca, New York. Author of Stative and Middle in Indo-European.*

LANGUAGES OF THE WORLD (in part)

J.Hm. James Holderbaum. *Professor of Art, Smith College, Northampton, Massachusetts.*

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J.H.McM.S. John Hearsey McMillan Salmon. *Marjorie Walter Goodhart Professor Emeritus of History, Bryn Mawr College, Pennsylvania. Author of Renaissance and Revolt: Essays in the Intellectual and Social History of Early Modern France and others.*

EUROPEAN HISTORY AND CULTURE (in part)

J.H.O. John H. Ostrom. *Emeritus Professor of Geology, Yale University; former Curator of Vertebrate Paleontology, Peabody Museum of Natural History. Coauthor of Marsh's Dinosaurs: The Collections from Como Bluff.*

DINOSAURS

J.H.Py. John Horace Parry (d. 1982). *Gardiner Professor of Oceanic History and Affairs, Harvard University, 1965–82. Author of A Short History of the West Indies and others.*

WEST INDIES, THE (in part)

J.H.R. John H. Rizley (d. 1994). *Manager, Materials Research and Process Engineering, General Dynamics Corporation, Pomona, California. Coauthor of Metals Handbook.*

INDUSTRIES, EXTRACTION AND PROCESSING (in part)

J.H.Ro. Jonathan H. Robbins, M.D. *Director, Cardiology Section, Leominster Hospital, Massachusetts.*

DISEASE (in part)

J.H.Sh. J.H. Shennan. *Deputy-Vice-Chancellor and Professor of European History, University of Lancaster, England. Author of Government and Society in France, 1461–1661 and others.*

FRANCE (in part)

J.H.Sm. The Rev. James Hutchinson Smylie. *Ernest Trice Thompson Professor of Church History, Union Theological Seminary, Richmond, Virginia. Editor, American Presbyterians: Journal of Presbyterian History.*

ADVENTIST (Micropædia)

J.H.-s.S. The Rev. Joseph Hsing-san Shih. *Professor of Missions and Sinology, Pontifical Gregorian University, Rome, Italy. Contributor to Studia Missionalia.*

RICCI, MATTEO (Micropædia)

J.Hud. Joseph Hudnut (d. 1968). *Professor of Architecture and Dean, Graduate School of Design, Harvard University, 1935–53. Author of Modern Sculpture and others.*

SCULPTURE, THE HISTORY OF WESTERN (in part)

J.H.W. John Humphreys Whitfield (d. 1995). *Serena Professor of Italian Language and Literature, University of Birmingham, England, 1946–74. Author of Petrarch and the Renaissance and others.*

PETRARCH (in part) (Micropædia)

PIRANDELLO, LUIGI (Micropædia)

J.H.Wa. James Hamilton Ware, Jr. *Professor of Philosophy and Religion, Austin College, Sherman, Texas. Author of Chinese Religions.*

CHUANG-TZU (Micropædia)

J.H.We. John H. Wellington. *Emeritus Professor of Geography, University of the*

Witwatersrand, Johannesburg. *Author of Southern Africa.*

AFRICA (in part)

J.H.Wi. John Hoyt Williams. *Professor of History, Indiana State University, Terre Haute. Author of The Rise and Fall of the Paraguayan Republic, 1800–1870.*

PARAGUAY (in part)

J.H.Y. John H. Yopp. *Professor of Plant Biology; Associate Vice President for Academic Affairs; Dean, Graduate School, Southern Illinois University at Carbondale. Coeditor of Symmetries in Science IV and Bioassays and Other Special Techniques for Plant Hormones and Plant Growth Regulators.*

PLANTS (in part)

J.H.Z. James Herbert Zumberge (d. 1992). *President, University of Southern California, Los Angeles, 1980–91. Author of Elements of Geology.*

GEOMORPHIC PROCESSES (in part)

Ji.B. Jillian Becker. *Director, Institute for the Study of Terrorism, London. Author of Hitler's Children: The Story of the Baader-Meinhof Terrorist Gang.*

CRIME AND PUNISHMENT (in part)

J.I.C. John Innes Clarke. *Emeritus Professor of Geography, University of Durham, England. Coeditor of Population and Development Projects in Africa.*

AFRICA (in part)

NORTH AFRICA (in part)

J.I.M.S. John I.M. Stewart (d. 1994). *Reader in English Literature, University of Oxford, 1969–73. Author of Rudyard Kipling.*

KIPLING, RUDYARD (in part) (Micropædia)

SHAW, GEORGE BERNARD (in part)

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J.I.S. James Irvine Smith. *Queen's Counsel. Former Sheriff of North Strathclyde; former Sheriff of Glasgow.*

LEGAL SYSTEMS, THE EVOLUTION OF MODERN WESTERN (in part)

J.J. Jules Janick. *James Troop Distinguished Professor of Horticulture, Purdue University, West Lafayette, Indiana. Author of Horticultural Science.*

GARDENING AND HORTICULTURE (in part)

J.-J.C. Jean-Jacques Chevallier (d. 1983). *Professor of the History of Political Thought, University of Paris. Author of Mirabeau and others.*

MIRABEAU, HONORÉ-GABRIEL RIQUETI,

COMTE DE (Micropædia)

J.J.Ca. John J. Cahir. *Professor of Meteorology; Associate Dean, College of Earth and Mineral Sciences, Pennsylvania State University, University Park. Coauthor of Principles of Climatology and others.*

CLIMATE AND WEATHER (in part)

J.J.Ch. J.J. Chambliss. *Professor of Education, Rutgers University, New Brunswick, New Jersey. Author of Educational Theory as Theory of Conduct.*

EDUCATION, HISTORY OF (in part)

J.J.C.S. John Jamieson Carswell Smart. *Emeritus Professor of Philosophy, Institute of Advanced Studies, Australian National University, Canberra. Emeritus Professor of*

Philosophy, University of Adelaide, Australia. Author of Philosophy and Scientific Realism and others; editor of Problems of Space and Time.

PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (in part)

TIME (in part)

J.J.G. Jeremy John Gray. *Senior Lecturer in Mathematics, Open University, Milton Keynes, England. Author of Linear Differential Equations and Group Theory from Riemann to Poincaré and others.*

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J.J.Gu. J.J. Guy. *Professor of History, University of Natal, Durban, South Africa. Author of The Destruction of the Zulu Kingdom and others.*

SOUTHERN AFRICA (in part)

J.J.Ha. James J. Haggerty. *Freelance writer, specializing in aviation and space technology. Editorial consultant, Aerospace Industries Association, 1957–94; Editor, Aerospace Year Book, 1957–70.*

INDUSTRIES, MANUFACTURING (in part)

J.J.Ho. John J. Honigmann (d. 1977). *Professor of Anthropology, University of North Carolina at Chapel Hill, 1955–77. Author of World of Man.*

AMERICAN PEOPLES, NATIVE (in part)

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MEXICO (in part)

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ARCHITECTURE, THE HISTORY OF WESTERN (in part)

SCULPTURE, THE HISTORY OF WESTERN (in part)

J.J.No. J. Jeremy Noble. *Professor of Music, State University of New York at Buffalo.*

BYRD, WILLIAM (Micropædia)

J.J.P. Jan J. Poelhekke. *Emeritus Professor of Modern History, Catholic University of Nijmegen, The Netherlands. Author of De Vrede van Munster and others.*

FREDERICK HENRY, PRINCE OF ORANGE (Micropædia)

OLDENBARNEVELT, JOHAN VAN (Micropædia)

J.J.Pe. Jaroslav Jan Pelikan. *Sterling Professor of History, Yale University. President, American Academy of Arts and Sciences. Author of The Christian Tradition; The Riddle of Roman Catholicism; and others.*

CHRISTIANITY (in part)

JESUS (in part)

MARY (MOTHER OF JESUS) (in part)

(Micropædia)

ROMAN CATHOLICISM (in part)

J.J.S. John J. Stoudt. *Professor of Philosophy, Kutztown State College, Pennsylvania, 1965–70. Freelance writer and researcher. Author of Jacob Boehme: His Life and Thought and others.*

BÖHME, JAKOB (Micropædia)

J.J.Se. Jean J. Seznec (d. 1983). *Marshal Foch Professor of French Literature, University of Oxford, 1950–72. Author of Marcel Proust et les dieux and others.*

MICHELET, JULES (Micropædia)

J.J.Sh. James J. Sheehan. *Professor of History, Stanford University, California. Author of German History, 1770–1866; "The German States and the European Revolution," in Revolution and the Meaning of Freedom in the Nineteenth Century.*

GERMANY (in part)

J.J.Sp. Joseph J. Spengler (d. 1991). *James B. Duke Professor of Economics, Duke University, Durham, North Carolina, 1955–71. Author of Population Economics and others.*

RICARDO, DAVID (Micropædia)

J.J.V. John J. Veevers. *Professor of Earth Sciences, Macquarie University, Sydney, Australia. Editor of Phanerozoic Earth History of Australia.*

AUSTRALIA (in part)

J.J.W. John J. Winberry. *Professor of Geography, University of South Carolina, Columbia. Coauthor of South Carolina: A Geography.*

UNITED STATES OF AMERICA (in part)

J.J.Z. Joseph J. Zasloff. *Professor of Political Science, University of Pittsburgh, Pennsylvania. Coauthor of Apprentice Revolutionaries: The Communist Movement in Laos, 1930–1985.*

SOUTHEAST ASIA (in part)

J.K. Jerome Kagan. *Professor of Psychology, Harvard University. Author of Unstable Ideas: Temperament, Cognition, and Self and many others.*

BEHAVIOUR, THE DEVELOPMENT OF HUMAN (in part)

J.Ke. James Kerney, Jr. (deceased). *Editor, Trenton Times Newspapers, New Jersey, 1965–74; Publisher, 1962–73.*

UNITED STATES OF AMERICA (in part)

J.K.-G. Joan Kelly-Gadol (d. 1982). *Professor of History, City College, City University of New York, 1972–82. Author of Leon Battista Alberti.*

ALBERTI, LEON BATTISTA (Micropædia)

J.Ki. Jay Kinsbruner. *Professor of History, Queens College, City University of*

New York. Author of *Bernardo O'Higgins and others*.

O'HIGGINS, BERNARDO (Micropædia)

J.K.J. J. Knox Jones, Jr. (d. 1992). *Paul Whitfield Horn Distinguished Professor of Biological Sciences and Museum Science, Texas Tech University, Lubbock, 1986–92. Coeditor of Orders and Families of Recent Mammals of the World.*

MAMMALS (in part)

J.K.L. John K. Loosli. Emeritus Professor of Animal Nutrition, Cornell University, Ithaca, New York. Visiting Professor of Animal Science, University of Florida, Gainesville. Coauthor of *Animal Nutrition*.

FARMING AND AGRICULTURAL TECHNOLOGY (in part)

J.K.La. John Kingsley Lattimer, M.D. Emeritus Professor of Urology, Columbia University. Director, Squier Urological Clinic, Presbyterian Hospital, New York City.

REPRODUCTION AND REPRODUCTIVE SYSTEMS (in part)

J.Kr. Julian Krzyżanowski (d. 1976). *Professor of the History of Polish Literature, University of Warsaw, 1934–66. President, Mickiewicz Literary Society. Author of Polish Romantic Literature.*

POLISH LITERATURE (in part)

J.K.Sh. John K.G. Shearman. Professor of Fine Arts, Harvard University. Author of *Andrea del Sarto and others*.

ANDREA DEL SARTO (Micropædia)

J.K.W. James King West (d. 1984). *Professor of Religion and Philosophy, Catawba College, Salisbury, North Carolina. Author of Introduction to the Old Testament.*

SAUL (Micropædia)

J.L. Joachim Lambek. Peter Redpath Professor Emeritus of Pure Mathematics, McGill University, Montreal. Coauthor of *Philosophical Reflections on the Foundations of Mathematics and many others*.

MATHEMATICS, THE FOUNDATIONS OF

J.La. Jean Lacouture. Former Professor, Institute for Political Studies, University of Paris. Adviser, Éditions du Seuil, Paris. Author of *Ho Chi Minh and others*.

HO CHI MINH (Micropædia)

J.L.A.F. Jean L.A. Fillozat (d. 1982). *Professor of Indian Languages and Literatures, College of France, Paris. Member, Institute of France. Author of Inde classique and others.*

HISTORY, THE STUDY OF (in part)

J.L.A.-L. Janet L. Abu-Lughod. Emerita Professor of Sociology, Northwestern University, Evanston, Illinois. Professor of Sociology, New School for Social Research, New York City. Author of *Cairo: 1001 Years of the City Victorious and others*.

CAIRO

J.L.B. John L. Berggren. Professor of Mathematics, Simon Fraser University, Burnaby, British Columbia. Author of *Episodes in the Mathematics of Medieval Islam*.

MATHEMATICS, THE HISTORY OF (in part)

J.L.C. John L. Cornwall. Professor of Economics, Dalhousie University, Halifax, Nova Scotia. Author of *The Theory of Economic Breakdown and others*.

ECONOMIC GROWTH AND PLANNING (in part)

J.-L.Ca. Jean-Louis Causou. Former Editor, *Opéra (journal)*, Paris. Author of *Rossini*.

ROSSINI, GIOACCHINO (Micropædia)

J.-L.Ch. Jean-Léon Charles. Professor of Military History, Belgian Royal Military Academy, Brussels. Author of *La ville de Saint-Trond au moyen-âge*.

FARNESE, ALESSANDRO, DUCA DI PARMA E PIACENZA (Micropædia)

J.L.D. Jack L. Dull (d. 1995). *Professor of History, University of Washington, Seattle. Editor of Han Social Structure; Han Agriculture.*

CHINA (in part)

WU-TI (HAN DYNASTY) (Micropædia)

J.L.Di. John L. Dietz. Professor of Geography, University of Northern Colorado, Greeley.

NORTH AMERICA (in part)

UNITED STATES OF AMERICA (in part)

J.Le. Jacques Levron. Honorary Chief Curator, Archives of France, Paris. Author of *Saint-Louis ou l'apogée du moyen-âge and others*.

LOUIS IX (FRANCE) (Micropædia)

J.L.Fi. John L. Fischer (deceased). *Professor of Anthropology, Tulane University, New Orleans. Coauthor of The Eastern Carolines.*

PACIFIC ISLANDS (in part)

J.L.F.-K. Judith L. Fridovich-Keil. Associate Professor of Genetics, Emory University, Atlanta, Georgia.

GENETICS AND HEREDITY (in part)

J.L.G. Judson Linsley Gressitt (d. 1982). *Director, Wau Ecology Institute, Papua New Guinea. Distinguished Chair of Zoology, Bernice P. Bishop Museum, Honolulu. Coauthor of Chrysomelidae of China; Insects of Campbell Island.*

INSECTS (in part)

J.L.Gi. James L. Gibbons, M.D. Former Professor of Psychiatry, University of Southampton, England. Editor of *Psychiatry*.

MENTAL DISORDERS AND THEIR TREATMENT (in part)

J.L.H. John Lawrance Howard. Former Head, Magnetic Division, Admiralty Compass Observatory, Slough, England. Author of several compass manuals.

NAVIGATION (in part)

J.L.He. John L. Heilbron. Senior Research Fellow at the University of Oxford. Author of *Geometry Civilized; The Sun in the Church; and others*.

GEOMETRY (in part)

J.L.H.K. John L.H. Keep. Emeritus Professor of Russian History, University of Toronto. Author of *The Russian Revolution: A Study in Mass Mobilization*.

MILYUKOV, PAVEL NIKOLAYEVICH (in part) (Micropædia)

NICHOLAS II (RUSSIA) (Micropædia)

J.-L.Hu. Jean-Louis Huot. Professor of Oriental Archaeology, University of Paris I. Author of *Iran*.

XERXES I (PERSIA) (Micropædia)

J.L.I.F. John Lister Illingworth Fennell (d. 1992). *Professor of Russian, University of Oxford, 1967–85. Author of Ivan the Great of Moscow and others.*

IVAN III (in part) (Micropædia)

J.L.L. James L. Luteyn. Senior Curator of Botany, New York Botanical Garden, Bronx. Author of *Monograph of the Genus Cavendishia (Ericaceae)*.

ANGIOSPERMS (in part)

J.L.M. John Lawrence Mero. President, Ocean Resources, Inc., La Jolla, California. Author of *The Mineral Resources of the Sea*.

OCEANS (in part)

J.L.McK. The Rev. John L. McKenzie (d. 1991). *Professor of Theology, DePaul University, Chicago, 1970–78. Author of Dictionary of the Bible and others.*

ROMAN CATHOLICISM (in part)

SAMUEL (Micropædia)

J.L.Me. Julian Louis Meltzer (d. 1977). *Executive Vice-Chairman, Yad Chaim Weizmann National Memorial, and Director, Weizmann Archives, Rehovot, Israel, 1966–75. Managing editor of Weizmann Letters and Papers.*

WEIZMANN, CHAIM (Micropædia)

J.Lo. James Lockhart. Professor of History, University of California, Los Angeles. Author of *Spanish Peru, 1532–1560: A Colonial Society and others*.

LATIN AMERICA, THE HISTORY OF (in part)

J.L.Ra. John Lang Rawlinson. Professor of History, Hofstra University, Hempstead, New York. Author of *China's Struggle for Naval Development, 1839–1895*.

LI HUNG-CHANG (Micropædia)

J.L.Ro. J. Lewis Robinson. Emeritus Professor of Geography, University of British Columbia, Vancouver. Author of *Concepts and Themes in the Regional Geography of Canada and others*.

NORTH AMERICA (in part)

J.L.S. J.L. Styan. Franklyn Bliss Snyder Professor Emeritus of English Literature and Theatre, Northwestern University, Evanston, Illinois. Author of *The Elements of Drama; Shakespeare's Stagecraft; Chekhov in Performance; and others*.

LITERATURE, THE ART OF (in part)

J.L.Sa. Jeffrey L. Sammons. Professor of German, Yale University. Author of *Heinrich Heine: A Modern Biography*.

HEINE, HEINRICH (Micropædia)

J.L.Sc. Joseph L. Schofer. Professor of Civil Engineering and Transportation; Director of Research, Transportation Center, Northwestern University, Evanston, Illinois. Author of numerous articles on urban transportation.

TRANSPORTATION (in part)

J.L.Sp. Jay L. Spaulding. Associate Professor of History, Kean College of New Jersey, Union. Coauthor of *Kingdoms of the Sudan*.

SUDAN, THE (in part)

J.L.T. John L. Thomas. *Professor of History, Brown University, Providence, Rhode Island. Author of The Liberator: William Lloyd Garrison.*

GARRISON, WILLIAM LLOYD (Micropædia)

J.L.Te. John L. Teall (d. 1979). *Professor of History, Mount Holyoke College, South Hadley, Massachusetts, 1947–94. Author of The Coauthor of Atlas of World History.*

BYZANTINE EMPIRE, THE HISTORY OF THE (in part)

J.Lu. John Lukacs. *Professor of History, Chestnut Hill College, Philadelphia, Pennsylvania, 1947–94. Author of The Hitler of History and others.*

HITLER, ADOLF (in part)

J.L.W. James L. Wescoat, Jr. *Associate Professor of Geography, University of Colorado at Boulder. Author of Integrated Water Development; Water Use and Conservation Practice in Western Colorado.*

NORTH AMERICA (in part)

J.Ly. John Lyman (d. 1977). *Professor of Oceanography; Marine Sciences Coordinator, University of North Carolina at Chapel Hill, 1968–73. Coauthor of Ocean Sciences.*

MAPPING AND SURVEYING (in part)

J.Lyo. Sir John Lyons. *Master of Trinity Hall, University of Cambridge. Professor of Linguistics, University of Sussex, Brighton, England, 1976–84. Author of Introduction to Linguistic Semantics; Language and Linguistics.*

LINGUISTICS (in part)

J.M. The Rev. John Meyendorff (d. 1992). *Dean, St. Vladimir's Orthodox Theological Seminary, Tuckahoe, New York, 1984–92; Professor of Church History and Patristics, 1959–92. Professor of Byzantine and East European History, Fordham University, New York City, 1967–92. Author of The Orthodox Church, Its Past and Its Role in the World Today.*

EASTERN ORTHODOXY (in part)

J.Ma. Joseph Machlis. *Emeritus Professor of Music, Queens College, City University of New York. Author of The Enjoyment of Music and others.*

COPLAND, AARON (in part) (Micropædia)

J.MacG. Janet MacGaffey. *Assistant Professor of Anthropology, Bucknell University, Lewisburg, Pennsylvania.*

KINSHASA (in part)

J.M.A.-N. Jamil M. Abun-Nasr. *Professor of Islamic Studies, University of Bayreuth, Germany. Author of A History of the Maghrib in the Islamic Period and others.*

NORTH AFRICA (in part)

J.M.B. James M. Broadus (d. 1994). *Director, Marine Policy Center, Woods Hole Oceanographic Institution, Massachusetts, 1986–94.*

ATLANTIC OCEAN, THE (in part)

J.M.Bo. James M. Borders. *Associate Professor of Musical History and Musicology; Curator, Stearns Collection of Musical Instruments, University of Michigan, Ann Arbor. Author of European*

and American Wind and Percussion Instruments.

MUSICAL INSTRUMENTS (in part)

J.M.B.S. Jeremy M.B. Smith. *Associate Professor of Geography and Planning, University of New England, Armidale, New South Wales. Station Leader, 1996 Australian National Antarctic Research Expedition to Macquarie Island, Australian Antarctic Division, Australian Cooperative Research Centre, Hobart, Tasmania. Editor of A History of Australasian Vegetation.*

BIOSPHERE AND CONCEPTS OF ECOLOGY, THE (in part)

J.M.Bu. Julian Medforth Budden. *Former External Services Music Organizer, British Broadcasting Corporation, London. Author of The Operas of Verdi.*

BEETHOVEN

J.M.C. John M. Crowley. *Professor of Geography, University of Montana, Missoula.*

UNITED STATES OF AMERICA (in part)

J.M.Ca. Janet M. Cartwright. *Attorney. UNITED STATES OF AMERICA (in part)*

J.McL. John McLaughlin. *Former Political Writer, Trenton Times Newspapers, New Jersey.*

UNITED STATES OF AMERICA (in part)

J.M.Co. John Michael Cohen (d. 1989). *Writer, critic, and scholar. Translator of Rabelais, Cervantes, and others.*

RABELAIS, FRANÇOIS (in part) (Micropædia)

J.M.C.T. Jocelyn M.C. Toynbee (d. 1985). *Laurence Professor of Classical Archaeology, University of Cambridge, 1951–62. Author of The Art of the Romans.*

PAINTING, THE HISTORY OF WESTERN (in part)

SCULPTURE, THE HISTORY OF WESTERN (in part)

J.M.F.P. José M.F. Pastor. *Town and regional planning expert. President, Town Planning Council, Buenos Aires. Author of Urbanismo con planeamiento.*

BUENOS AIRES (in part)

J.M.G. Jean Marie Gehring. *Lecturer in Geography, University of Metz, France. Author of Le Luxembourg un espace ouvert de l'Europe rhénane.*

LUXEMBOURG (in part)

J.Mh. Jerry March. *Professor of Chemistry, Adelphi University, Garden City, New York. Author of Advanced Organic Chemistry and others.*

CHEMICAL COMPOUNDS (in part)

J.M.H. Joan Mervyn Hussey. *Emeritus Professor of History, Royal Holloway College, University of London. Author of The Byzantine World and others.*

ALEXIUS I COMNENUS (Micropædia)

BASIL I (BYZANTINE EMPIRE) (Micropædia)

BASIL II (BYZANTINE EMPIRE) (Micropædia)

JUSTINIAN I (in part) (Micropædia)

J.M.Ha. J.M. Hayes. *Distinguished Professor of Biogeochemistry, Indiana University, Bloomington. Coauthor of Chemical Separations and Measurements.*

ATMOSPHERE (in part)

J.Mir. Jeannette Mirsky (d. 1987). *Visiting Fellow, Department of East Asian Studies, Princeton University, 1970–74. Coauthor of The World of Eli Whitney.*

WHITNEY, ELI (in part) (Micropædia)

J.M.J.M. Jan Maria Juul Materné. *Research Assistant, General State Archives, Brussels.*

BELGIUM (in part)

J.M.J.v.H. Baron Jean M.J. van Houtte (d. 1991). *Minister of State, Government of Belgium, 1966; Minister of Finance, 1950–52, 1958–61; Prime Minister, 1952–54. Professor of Fiscal Law, State University of Ghent. Professor of Penal Law, State University of Liège.*

TAXATION (in part)

J.M.K. Joseph M. Kitagawa (d. 1992). *Professor of the History of Religions and of Far Eastern Languages and Civilizations, University of Chicago, 1964–85; Dean, Divinity School, 1970–80. Author of Religions of the East and others.*

BUDDHISM, THE BUDDHA AND (in part)

J.M.L. Jacob M. Landau. *Professor of Political Sciences, Hebrew University of Jerusalem. Author of Studies in the Arab Theatre and Cinema and others.*

ISLAMIC ARTS (in part)

J.M.Lo. John M. Logsdon. *Director, Space Policy Institute, Elliott School of International Affairs; Professor of Political Science and International Affairs, George Washington University, Washington, D.C. General editor of Exploring the Unknown: Selected Documents in the History of the U.S. Civil Space Program; coeditor of Eye in the Sky: The Story of the Corona Spy Satellites.*

EXPLORATION (in part)

Jm.L.W. James L. Watson. *Fairbank Professor of Chinese Society; Professor of Anthropology, Harvard University. Editor of Golden Arches East: McDonald's in East Asia and others.*

GLOBALIZATION AND CULTURE

J.M.M.-R. J.M. Munn-Rankin (d. 1981). *Lecturer in Near Eastern History, University of Cambridge, 1949–81. Contributor to The Cambridge Ancient History.*

DARIUS I (Micropædia)

J.M.N.-D. John M. Newsom-Davis. *Professor of Clinical Neurology, University of Oxford. Coauthor of Respiratory Muscles: Mechanics and Neural Control.*

MUSCLES AND MUSCLE SYSTEMS (in part)

J.Mo. The Rev. Jacques Monet, S.J. *President, University of Sudbury, Ontario. Author of The Last Cannon Shot: A Study of French-Canadian Nationalism.*

LAURIER, SIR WILFRID (Micropædia)

J.M.O. Jane M. Oppenheimer. *Emeritus Professor of Biology and the History of Science, Bryn Mawr College, Pennsylvania. Author of Essays in the History of Embryology and Biology.*

BAER, KARL ERNST, RITTER VON, ELDER VON HUTHORN (Micropædia)

DRIESCH, HANS ADOLF EDUARD (in part) (Micropædia)

J.M.P. John M. Prausnitz. *Professor of Chemical Engineering, University of California, Berkeley. Author of Molecular Thermodynamics of Fluid-Phase Equilibria.*

MATTER (in part)

J.M.Pe. Jeanne Marie Penvenne. *Assistant Professor of History, Tufts University, Medford, Massachusetts. Research Fellow, African Studies Center, Boston University.*

SOUTHERN AFRICA (in part)

J.M.Po. James M. Powell. *Professor of Medieval History, Syracuse University, New York. Author of Anatomy of a Crusade, 1213–21.*

ALEXANDER III (PAPACY) (Micropædia)

GREGORY IX (PAPACY) (Micropædia)

ITALY (in part)

J.M.R. Johannes M. Renger. *Professor of Assyriology, Free University of Berlin.*

HAMMURABI (Micropædia)

J.M.Re. Joe M. Regenstein. *Professor of Food Science, Cornell University, Ithaca, New York. Coauthor of Food Protein Chemistry: An Introduction for Food Scientists and others.*

FOOD PROCESSING (in part)

J.-M.-R.N. Jacques-M.-R. Nicolle (d. 1972). *Director, Laboratory of Isomeric Biochemistry, Collège de France, Paris. Author of Louis Pasteur, a Master of Scientific Inquiry.*

PASTEUR (in part)

J.M.S. John M. Simpson. *Senior Lecturer in Scottish History, University of Edinburgh.*

UNITED KINGDOM (in part)

J.M.S.T. Joyce M.S. Tompkins (d. 1986). *Reader in English, University of London, 1948–65. Author of The Popular Novel in England, 1770–1800.*

BRONTË, CHARLOTTE (in part) (Micropædia)

BRONTË, EMILY (in part) (Micropædia)

J.M.T. James M. Tanner, M.D. *Emeritus Professor of Child Health and Growth, Institute of Child Health, University of London. Author of A History of the Study of Human Growth and others.*

GROWTH AND DEVELOPMENT, BIOLOGICAL (in part)

J.Mu. Joachim Müller. *Professor of German Literature, Friedrich Schiller University of Jena, Germany.*

LESSING, GOTTHOLD EPHRAIM (in part) (Micropædia)

J.M.W.-H. John Michael Wallace-Hadrill (d. 1985). *Chichele Professor of Modern History, University of Oxford, 1974–83; Fellow of All Souls College, Oxford. Author of The Long-Haired Kings and others.*

CLOVIS I (Micropædia)

GERMANY (in part)

J.M.Ws. James M. Wells. *Former Vice President and Emeritus Custodian, John M. Wing Foundation on the History of Printing, Newberry Library, Chicago. Author of The Scholar Printers; "Book Typography in the U.S.A." in Book Typography in Europe and the U.S.*

PRINTING, TYPOGRAPHY, AND PHOTOENGRAVING (in part)

J.M.W.S. Jonathan M.W. Slack. *Professor of Cell and Molecular Biology, University of Bath, England. Author of From Egg to Embryo.*

CELLS (in part)

J.N. Josef Nadler (d. 1963). *Professor of the History of Literature, University of Vienna, 1931–45.*

GERMAN LITERATURE (in part)

J.Na. Jerome Namias (d. 1997). *Research Meteorologist, Scripps Institution of Oceanography, University of California, San Diego, at La Jolla, 1970–77. Chief, Extended Forecast Division, National Weather Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Washington, D.C., 1941–71. Author of "30-Day Forecasting," American Meteorological Society Monograph.*

ATLANTIC OCEAN, THE (in part)

J.N.B. John N. Burrus. *Distinguished University Professor Emeritus of Sociology and Anthropology, University of Southern Mississippi, Hattiesburg. Author of Life Opportunities: An Analysis of Differential Mortality in Mississippi and others.*

UNITED STATES OF AMERICA (in part)

J.N.C. John N. Cole. *Cofounder and Editor, Maine Times, Topsham, 1968–82. Author of In Maine and others.*

UNITED STATES OF AMERICA (in part)

J.N.D. James Norman Davidson (d. 1972). *Gardiner Professor of Biochemistry, University of Glasgow, Scotland, 1957–72. Author of Biochemistry of the Nucleic Acids.*

BIOCHEMICAL COMPONENTS OF ORGANISMS (in part)

J.N.D.K. The Rev. John N.D. Kelly (d. 1997). *Principal of St. Edmund Hall, Oxford, 1951–79; Lecturer in Patristic Studies, University of Oxford, 1948–76. Author of Early Christian Creeds and others.*

CHRISTIANITY (in part)

NESTORIUS (in part) (Micropædia)

J.N.G. James Nelson Goodsell (d. 1996). *Knight Professor of Journalism, University of Miami, Coral Gables, Florida. Editor of Fidel Castro's Personal Revolution in Cuba: 1959–1973 and others.*

HAVANA

J.N.H. John N. Hazard (d. 1995). *Nash Professor of Law, Columbia University, 1976–77. Author of Communists and Their Law; Managing Change in the U.S.S.R.; and others.*

LEGAL SYSTEMS, THE EVOLUTION OF MODERN WESTERN (in part)

J.N.M. Jitendra N. Mohanty. *Professor of Philosophy, Temple University, Philadelphia. Author of Gangeśa's Theory of Truth and others.*

INDIAN PHILOSOPHY

J.N.T. John N. Tuppen. *Professor of Intercultural Communication and Linguistics, Lyon College of Business, France. Author of The Economic Geography of France and others.*

FRANCE (in part)

MARSEILLE (in part)

J.N.Th. John N. Thompson. *Professor of Botany and Zoology, Washington State University, Pullman. Author of Interaction and Coevolution and others.*

BIOSPHERE AND CONCEPTS OF ECOLOGY, THE (in part)

J.Nu. Jack Nutting. *Metallurgical consultant. Emeritus Professor of Metallurgy, University of Leeds, England. Former President, Historical Metallurgy Society, London. Author of Microstructure of Metals.*

INDUSTRIES, EXTRACTION AND PROCESSING (in part)

J.O. The Rev. Joseph Owens, C.S.S.R. *Emeritus Professor of Philosophy, Pontifical Institute of Mediaeval Studies, University of Toronto. Author of The Doctrine of Being in the Aristotelian Metaphysics.*

PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (in part)

J.O.A. James Oladipo Adejuwon. *Professor of Geography, Obafemi Awolowo University, Ile-Ife, Nigeria.*

KINSHASA (in part)

Jo.A.M. Joseph A. Maguire. *Professor of Sociology of Sport, Loughborough University, England. Author of Global Sport: Identities, Societies, Civilizations and others.*

SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

Jo.A.W. John A. Wilson (d. 1976). *Andrew MacLeish Distinguished Service Professor of Egyptology, University of Chicago, 1953–68. Author of The Burden of Egypt and others.*

AKHENATON (Micropædia)

Jo.B. José Bonilla. *Town and regional planning expert. Codirector, Regional and Urban Planning Institute, Buenos Aires, Argentina, 1952–82.*

BUENOS AIRES (in part)

Jo.Be. John Beresford Bentley. *Former Managing Editor, Air-Cushion Vehicles (bimonthly); former Editor, Hoverfoil News.*

TRANSPORTATION (in part)

Jo.B.M. John Burnett Mitchell. *Lecturer in the History of Art, University of East Anglia, Norwich, England. Coeditor of San Vincenzo al Volturno: The Archaeology, Art and Territory of an Early Medieval Monastery.*

PAINTING, THE HISTORY OF WESTERN (in part)

Jo.Bo. Sir John Boardman. *Lincoln Professor Emeritus of Classical Art and Archaeology, University of Oxford. Author of Greek Art; The Greeks Overseas; and others.*

ARCHITECTURE, THE HISTORY OF WESTERN (in part)

PAINTING, THE HISTORY OF WESTERN (in part)

SCULPTURE, THE HISTORY OF WESTERN (in part)

Jo.Br. John Bright (d. 1995). *Professor of Hebrew and the Interpretation of the Old*

Testament, Union Theological Seminary, Richmond, Virginia, 1940–43; 1946–75. Author of A History of Israel and others.
EZRA (Micropædia)

J.O'B.R. John O'Beirne Ranelagh. *Television consultant. Member, Independent Television Commission. Commissioning Editor, Channel Four Television, London, 1981–87. Author of A Short History of Ireland and others.*
DUBLIN (in part)
IRELAND (in part)

Jo.Bu. The Rev. John Burnaby (d. 1978). *Regius Professor of Divinity, University of Cambridge, 1952–58. Author of Amor Dei: A Study in the Religion of St. Augustine and others.*
AUGUSTINE (in part)

Jo.C. John Cogley (d. 1976). *Senior Fellow, Center for the Study of Democratic Institutions, Santa Barbara, California, 1967–76; Editor, The Center Magazine, 1967–74. Author of The Layman and the Council and others.*
JOHN XXIII (PAPACY) (Micropædia)

J.O.C. John O. Corliss. *Emeritus Professor of Zoology, University of Maryland, College Park. Author of The Ciliated Protozoa.*
PROTISTS

Jo.Co. Johann Cooks. *Emeritus Professor of Geography, University of Pretoria, South Africa. Author of Exogenetic Landforms and others.*
AFRICA (in part)

Jo.D.H. Jonathan D. Hibbard. *Assistant Professor of Marketing, Boston University.*
MARKETING AND MERCHANDISING (in part)

Jo.E. Joseph John Ellis. *Professor of History, Mount Holyoke College, South Hadley, Massachusetts. Author of American Sphinx: The Character of Thomas Jefferson; Founding Brothers: The Revolutionary Generation.*
ADAMS, JOHN
JEFFERSON

Jo.E.B. John E. Bardach. *Senior Fellow Emeritus, Environment and Policy Institute, East-West Center, Honolulu. Director, Hawaii Institute of Marine Biology, University of Hawaii at Manoa, 1971–77. Author of Harvest of the Sea and others.*
PACIFIC OCEAN, THE (in part)

Jo.E.C. John Edwards Caswell. *Emeritus Professor of History, California State College, Stanislaus, Turlock, California. Author of Arctic Frontiers: U.S. Explorations in the Far North.*
HUDSON, HENRY (Micropædia)

Jo.E.F. John E. Flower. *Professor of French, University of Exeter, England. Author of Literature and the Left in France.*
FRANCE (in part)

Jo.E.S. Joseph E. Spencer (d. 1984). *Professor of Geography, University of California, Los Angeles. Coauthor of Asia, East by South.*
ASIA (in part)

Jo.E.W. John E. Woods. *Professor of Middle Eastern History, University of*

Chicago. Author of The Akquyunlu: Clan, Confederation, and Empire.

IRAQ (in part)
TURKEY AND ANCIENT ANATOLIA (in part)

J.O.Fl. Joseph O. Fletcher. *Former Director, Environmental Research Laboratories, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Boulder, Colorado.*
ATLANTIC OCEAN, THE (in part)

Jo.H. Josef Haekel (deceased). *Professor of Ethnology; Director, Institute for Ethnology, University of Vienna. Author of Zum Individual- und Geschlechtstotemismus in Australien.*
RELIGIONS AND SPIRITUAL BELIEF, SYSTEMS OF (in part)

Jo.Ha. Joseph Hashisaki (deceased). *Professor of Mathematics, Western Washington University, Bellingham. Coauthor of Theory of Arithmetic.*
SET THEORY (in part)

Jo.Hac. John Hackett. *Consultant, Organization for Economic Cooperation and Development, Paris; Director for Financial, Fiscal, and Enterprise Affairs, 1979–89. Author of Economic Planning in France.*
ECONOMIC GROWTH AND PLANNING (in part)

Jo.Ho. John Hospers. *Emeritus Professor of Philosophy, University of Southern California, Los Angeles. Author of Understanding the Arts and others.*
PHILOSOPHIES OF THE BRANCHES OF KNOWLEDGE (in part)

Jo.J.J. Joseph J. Jen. *Dean, College of Agriculture, California Polytechnic State University, San Luis Obispo. Editor of Quality Factors of Fruits and Vegetables: Chemistry and Technology.*
FOOD PROCESSING (in part)

Jo.K. Joseph Kerman. *Musicologist and music critic. Emeritus Professor of Music, University of California, Berkeley. Author of The Beethoven Quartets; Concerto Conversations; and many others.*
VERDI, GIUSEPPE (in part) (Micropædia)

Jo.L. John Larner. *Titular Professor of History, University of Glasgow, Scotland. Author of Italy in the Age of Dante and Petrarch, 1216–1380 and others.*
ITALY (in part)

Jo.La. Jorgen Laessoe (d. 1993). *Professor of Assyriology, University of Copenhagen. Author of People of Ancient Assyria and others.*
SARGON II (ASSYRIA) (Micropædia)

Jo.Ly. John Lynch. *Emeritus Professor of Latin-American History, University of London. Author of Bourbon Spain and others.*
CHARLES III (SPAIN) (Micropædia)

Jo.M. John Mitchell (d. 1990). *Freelance writer and translator.*
ITALIAN LITERATURE (in part)

Jo.Ma. John Marlowe. *Freelance writer. Author of Anglo-Egyptian Relations, 1800–1953; Cromer in Egypt.*
ZAGHLÜL, SA'D (Micropædia)

J.O'M.B. John O'M. Bockris. *Distinguished Professor of Chemistry, Texas A&M University, College Station. Coauthor of Fuel Cells: Their Electrochemistry; Surface Electrochemistry.*
CHEMICAL REACTIONS (in part)

Jo.Mo. Joel Mokyr. *Robert H. Strotz Professor of Arts and Sciences; Professor of Economics and History, Northwestern University, Evanston, Illinois. Author of Why Ireland Starved: A Quantitative and Analytical History and many others.*
IRISH POTATO FAMINE (Micropædia)

Jo.M.P. Joseph Michael Powell. *Professor of Geography, Monash University, Clayton, Victoria, Australia. Author of An Historical Geography of Modern Australia and others.*
AUSTRALIA (in part)

Jo.Ms. John Markakis. *Professor of African Studies, University of Crete, Réthimnon, Greece. Author of Ethiopia: Anatomy of a Traditional Polity and others.*
EASTERN AFRICA (in part)

Jo.N. John Naisbitt. *Social forecaster, lecturer, and writer. Author of Megatrends and others.*
UNITED STATES OF AMERICA (in part)

Jo.Pl. Sir John Plumb. *Professor of Modern English History, University of Cambridge, 1966–74; Master of Christ's College, Cambridge, 1978–82. Author of England in the Eighteenth Century; Sir Robert Walpole; and others.*
WALPOLE, ROBERT, 1ST EARL OF ORFORD (Micropædia)

Jo.Pr. Joshua Praver (d. 1990). *Professor of Medieval History, Hebrew University of Jerusalem, 1958–90. Editor in Chief, Encyclopaedia Hebraica. Author of The History of the Jews in the Latin Kingdom of Jerusalem.*
JERUSALEM (in part)

Jo.R. John A. Rowe. *Associate Professor of African History, Northwestern University, Evanston, Illinois.*
KENYATTA, JOMO (in part) (Micropædia)

J.Or. Jean Orcibal. *Director of Studies, Religious Sciences Division, Institute for Advanced Research, Paris.*
PASCAL (in part)

J.O.R. John O. Rasmussen, Jr. *Emeritus Professor of Chemistry, University of California, Berkeley. Author of "Models of Heavy Nuclei" in Nuclear Spectroscopy and others.*
ATOMS (in part)

Jo.R.M. John Richard Masson. *Executive Director, Swaziland Cane Growers' Association, Mbabane.*
SOUTHERN AFRICA (in part)

Jo.S. The Rev. John Stacey. *Former Secretary, Local Preachers' Office, British Methodist Church, London; former Editor, Epworth Press. Author of John Wyclif and Reform and others.*
WYCLIFFE, JOHN (Micropædia)

J.O.S. John Oliver Stoner, Jr. *Professor of Physics, University of Arizona, Tucson.*

ANALYSIS AND MEASUREMENT, PHYSICAL AND CHEMICAL (in part)

Jo.Si. Joseph Silverman. *Emeritus Professor of Materials and Nuclear Engineering, University of Maryland, College Park. Coeditor of Radiation Processing of Polymers.*
RADIATION (in part)

Jo.S.R. John Shipley Rowlinson. *Dr. Lee's Professor Emeritus of Chemistry, University of Oxford. Author of Liquids and Liquid Mixtures.*
MATTER (in part)

Jo.St. John Strugnell. *Professor of Christian Origins, Harvard University.*
JOHN THE BAPTIST, SAINT (Micropædia)

J.O'T. James Joseph O'Toole. *Vice President, Aspen Institute. University Associates' Professor of Management and Organization, University of Southern California, Los Angeles, 1982-93. Author of Leading Change and others.*
FUTUROLOGY (in part) (Micropædia)

Jö.We. Jörgen Weibull. *Emeritus Professor of History, Göteborg University, Sweden. Author of Carl Johan och Norge 1810-1814 and others.*
DENMARK (in part)
FINLAND (in part)
NORWAY (in part)
SWEDEN (in part)

Jo.W.P. John Whitney Pickersgill. *President, Canadian Transport Commission, Ottawa, 1967-72. Member, House of Commons, Parliament of Canada, 1953-67. Coauthor of The Mackenzie King Record.*
KING, W.L. MACKENZIE (Micropædia)

J.P. Jan Pen. *Professor of Economics, State University of Groningen, The Netherlands. Author of Income Distribution and others.*
ECONOMIC THEORY (in part)

J.Pa. Juan Papadakis. *Member, Academy of Athens. Former Professor, University of Buenos Aires. Author of Soils of the World.*
SOILS

J.P.D. Jean P. Dorst. *Professor, National Museum of Natural History, Paris. Author of The Migration of Birds and others.*
BEHAVIOUR, ANIMAL (in part)
SOUTH AMERICA (in part)

J.-P.E. Jean-Pierre Erpelding (d. 1977). *President, Section of Arts and Literature, Grand-Ducal Institute, Luxembourg, 1962-68. Author of Luxemburg 1000 Jahre.*
LUXEMBOURG (in part)

J.P.-H. Sir John Pope-Hennessy (d. 1994). *Professor of Fine Arts, New York University, 1977-92. Consultative Chairman, Department of European Paintings, Metropolitan Museum of Art, New York City, 1977-86. Author of Cellini and others.*
CELLINI, BENVENUTO (Micropædia)

J.P.Hy. J. Philip Hyatt (d. 1972). *Professor of Old Testament, Vanderbilt University, Nashville, Tennessee, 1944-72.*

Author of Jeremiah: Prophet of Courage and Hope and others.

JEREMIAH (in part) (Micropædia)

J.Pi. John Picton. *Lecturer in African Art, School of Oriental and African Studies, University of London. Coauthor of African Textiles.*

AFRICAN ARTS (in part)

J.Piv. Jean Piveteau. *Professor of Palaeontology, University of Paris. Editor of Oeuvres philosophiques de Buffon.*
BUFFON, GEORGES-LOUIS LECLERC, COMTE DE (Micropædia)

J.P.J. J. Philip Jenkins. *Professor of History and Religious Studies, Pennsylvania State University, University Park.*

ALCOHOL AND DRUG CONSUMPTION (in part)
CHILD ABUSE (Micropædia)
DESIGNER DRUG (Micropædia)
ECSTASY (Micropædia)
HIJACKING (in part) (Micropædia)
MANSON, CHARLES (Micropædia)
METHAMPHETAMINE (Micropædia)
PORNOGRAPHY (Micropædia)
SKINHEAD (Micropædia)
TERRORISM (in part) (Micropædia)
WHITE SUPREMACY (Micropædia)

J.P.K. John P. Kenyon (d. 1996). *Joyce and Elizabeth Hall Distinguished Professor of Early Modern British History, University of Kansas, Lawrence, 1987-94. Professor of Modern History, University of St. Andrews, Scotland, 1981-87. Author of The Stuarts.*
JAMES II (GREAT BRITAIN) (Micropædia)

J.-p.L. Jung-pang Lo (d. 1981). *Professor of History, University of California, Davis, 1969-76. Author of K'ang Yu-wei: A Biography and a Symposium.*
CHENG HO (Micropædia)
K'ANG YU-WEI (Micropædia)

J.Pl. Jaan Puhvel. *Emeritus Professor of Classics and Indo-European Studies, University of California, Los Angeles.*
HISTORY, THE STUDY OF (in part)
WRITING (in part)

J.P.M. John Preston Moore. *Emeritus Professor of History, Louisiana State University, Baton Rouge. Author of The Cabildo in Peru Under the Bourbons.*
PERU (in part)

J.P.Mo. J. Philip Mosley. *Associate Professor of English, Communications, and Comparative Literature, Pennsylvania State University, Worthington Scranton Campus, Dunmore.*
BELGIAN LITERATURE (in part)

J.P.M.S. J. Patricia Morgan Swenson. *Freelance writer and editor. Author of Hawaii: A Book to Begin On and others.*
UNITED STATES OF AMERICA (in part)

J.Pn. J. Preston. *Senior Research Scientist, Research Triangle Institute, Research Triangle Park, North Carolina. Coeditor of Handbook of Fiber Science and Technology (vol. 3).*
INDUSTRIAL POLYMERS (in part)

J.Po. Jerry C. Podany. *Head of Antiquities Conservation, J. Paul Getty Museum, Los Angeles. President, American Institute for Conservation of Historic and Artistic Works (AIC).*

ART CONSERVATION AND RESTORATION (in part)

J.P.Pl. John P. Plamenatz (d. 1975). *Chichele Professor of Social and Political Theory, University of Oxford, 1967-75; Fellow of All Souls College, Oxford. Author of The English Utilitarians.*
BENTHAM, JEREMY (in part) (Micropædia)

J.P.P.R. J.P. Perry Robinson. *Senior Fellow, Science Policy Research Unit, University of Sussex, Brighton, England. Coauthor of The Problem of Chemical and Biological Warfare (6 vol.).*
WAR, THE TECHNOLOGY OF (in part)

J.Pr. Jean Prevost. *Former Professor of Biology, French University of the Pacific, Nouméa, New Caledonia. Author of Le Manchot empereur; coeditor of Biologie antarctique.*
BIRDS (in part)

J.P.R. Jean Pierre Rouch. *Director of Research, National Centre for Scientific Research, Paris. Author of Les Songhay.*
MUHAMMAD I ASKIA (Micropædia)

J.P.Ri. Joseph P. Riva, Jr. *Specialist in Earth Sciences (geologist), Congressional Research Service, Library of Congress, Washington, D.C. Author of World Petroleum Resources and Reserves and others.*
FUELS, FOSSIL (in part)

J.P.S. James Patrick Saville. *Former Manager, Information Services, The Metals Society, London.*
BESSEMER, SIR HENRY (Micropædia)

J.P.-V. Javier Pulgar-Vidal. *Emeritus Professor of Geography, National University of San Marcos, Lima. Author of Geografía del Perú: Las ocho regiones naturales and others.*
PERU (in part)

J.P.V.D.B. John P.V. Dacre Balsdon (d. 1977). *Fellow of Exeter College, University of Oxford, 1928-69. Author of Life and Leisure in Ancient Rome.*
CICERO, MARCUS TULLIUS (in part) (Micropædia)
MARIUS, GAIUS (Micropædia)

J.R. Jacques Ryckmans. *Emeritus Professor of Semitic Studies, Catholic University of Louvain, Louvain-la-Neuve, Belgium. Author of La Persécution des Chrétiens Himyarites au Sixième Siècle and others.*

MIDDLE EASTERN RELIGIONS, ANCIENT (in part)

J.R.B. James R. Brandon. *Professor of Drama and Theatre, University of Hawaii, at Manoa, Honolulu. Author of Theatre in Southeast Asia and others.*
EAST ASIAN ARTS (in part)
SOUTHEAST ASIAN ARTS (in part)

J.R.Ba. John R. Baines. *Professor of Egyptology, University of Oxford. Coauthor of Atlas of Ancient Egypt.*
EGYPT (in part)
MIDDLE EASTERN RELIGIONS, ANCIENT (in part)

J.R.Br. John Russell Brown. *Professor of Theatre, University of Michigan, Ann*

Arbor. Author of Shakespeare, Actors, and Audiences and others.

SHAKESPEARE (in part)

J.R.C. John R. Campbell. *President Emeritus, Oklahoma State University, Stillwater. Dean, College of Agriculture, University of Illinois, Urbana-Champaign, 1983–88. Coauthor of The Science of Animals That Serve Humanity.*

AGRICULTURAL SCIENCES (in part)

J.R.D. Jere R. Daniell. *Professor of History, Dartmouth College, Hanover, New Hampshire. Author of Colonial New Hampshire: A History and others.*

UNITED STATES OF AMERICA (in part)

J.R.D.C. Julian R.D. Cobbing. *Senior Lecturer in History, Rhodes University, Grahamstown, South Africa.*

SOUTHERN AFRICA (in part)

J.R.De. James R. Denbow. *Associate Professor of Anthropology, University of Texas at Austin. Author of Uncovering Botswana's Past.*

SOUTHERN AFRICA (in part)

J.R.G. James R. Giles. *Professor of English, Northern Illinois University, De Kalb. Author of Confronting the Horror: The Novels of Nelson Algren and others.*

AMERICAN LITERATURE (in part)

J.R.Go. John Ross Goodner. *Senior Editor, Golf Digest. Author of Golf's Greatest and others.*

SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

J.R.K. Jerzy R. Krzyzanowski. *Emeritus Professor, Slavic Languages and Literatures, Ohio State University, Columbus. Author of Wladyslaw Stanislaw Reymont and many others.*

POLISH LITERATURE (in part)

J.R.Kr. John Richard Krueger. *Managing Editor, publications of the Mongolia Society, Indiana University, Bloomington; former Professor of Uralic and Altaic Studies. Coauthor of Introduction to Classical Mongolian.*

CENTRAL ASIAN ARTS (in part)

J.R.L.H. J.R.L. Highfield. *Emeritus Fellow of Merton College, Oxford; former Lecturer in Modern History, University of Oxford. Editor of Spain in the Fifteenth Century; coeditor of Europe in the Late Middle Ages.*

EDWARD III (ENGLAND AND GREAT BRITAIN) (in part) (Micropædia)

ISABELLA I (SPAIN) (Micropædia)

J.R.M. John Richard Meyer. *Associate Professor of Education, University of Windsor, Ontario.*

BERNARD DE CLAIRVAUX, SAINT (Micropædia)

J.R.Ma. Judith R. Mackrell. *Dance critic, The Guardian, London.*

DANCE, THE ART OF

J.R.Me. José Ramón Medina. *Poet and writer. Professor, Faculty of Law, Central University of Venezuela, Caracas. Attorney General of Venezuela, 1974–79. Author of Ochenta años de literatura venezolana and others.*

CARACAS (in part)

J.R.Mn. J. Ronald Munson. *Professor of Philosophy, University of Missouri, St. Louis. Author of Reasoning in Medicine.*

PHILOSOPHIES OF THE BRANCHES OF KNOWLEDGE (in part)

J.R.Mo. Joseph R. Morgan. *Associate Professor of Geography, University of Hawaii at Manoa, Honolulu. Coeditor of Atlas for Marine Policy in Southeast Asian Seas.*

INDIAN OCEAN, THE (in part)

PACIFIC OCEAN, THE (in part)

J.R.M.R. J. Roberto Moncada R. *President, MONDAI Engineers (engineering and architectural consultants), Tegucigalpa, Honduras. Director General of the National Geographic Institute, Tegucigalpa, 1969–71.*

CENTRAL AMERICA (in part)

J.R.N. J.R. Napier (d. 1987). *Director, Unit of Primate Biology, Birkbeck College, University of London. Coauthor of A Handbook of Living Primates; The Natural History of the Primates.*

MAMMALS (in part)

J.Ro. Joan Violet Robinson (d. 1983). *Professor of Economics, University of Cambridge, 1965–71. Author of Theory of Imperfect Competition and others.*

MARKETS (in part)

J.R.Po. J.R. Pole. *Rhodes Professor Emeritus of American History and Institutions, University of Oxford. Author of Political Representation in England and the Origins of the American Republic.*

UNITED STATES OF AMERICA (in part)

J.R.P.R. June R.P. Ross. *Professor of Biology, Western Washington University, Bellingham. Editor of Bryozoa.*

GEOCHRONOLOGY (in part)

J.R.R. James Robert Rice. *Gordon McKay Professor of Engineering Sciences and Geophysics, Harvard University. Coauthor of Solid Mechanics Research Trends and Opportunities, 1985; author of numerous papers on solid mechanics and fracture theory in engineering, materials physics, and seismology.*

MECHANICS (in part)

J.R.-S. John Graham Royde-Smith (d. 1986). *Associate Editor, History, Encyclopædia Britannica, London.*

BOURBON, THE HOUSE OF (in part)

HABSBURG, THE HOUSE OF
WORLD WARS, THE (in part)

J.R.Sp. John R. Spencer (d. 1994). *Professor of Art, Duke University, Durham, North Carolina. Editor of L.B. Alberti's On Painting.*

CIMABUE (Micropædia)

PAINTING, THE HISTORY OF WESTERN (in part)

SCULPTURE, THE HISTORY OF WESTERN (in part)

J.R.Su. Sir James R. Sutherland (d. 1996). *Professor of Modern English Literature, University College, University of London, 1951–67. Author of English Literature of the Late Seventeenth Century.*

DRYDEN, JOHN (in part) (Micropædia)

J.R.T. John Russell Taylor. *Art Critic, The Times (London); Film Critic, 1962–73.*

Professor of Cinema, University of Southern California, Los Angeles, 1972–78. Author of Cinema Eye, Cinema Ear: Some Key Film-Makers of the Sixties.

ANTONIONI, MICHELANGELO (Micropædia)

BERGMAN, INGMAR (Micropædia)

J.R.T.P. John Richard Thornhill Pollard. *Former Senior Lecturer in Classics, University College of North Wales, University of Wales, Bangor. Author of Birds in Greek Life and Myth; Helen of Troy; and others.*

EUROPEAN RELIGIONS, ANCIENT (in part)

J.R.V.P. John R.V. Prescott. *Professor of Geography, University of Melbourne, Australia. Author of Political Frontiers and Boundaries and others.*

AUSTRALIA (in part)

MELBOURNE (in part)

J.Ry. Judith Ryan. *Professor of German and Comparative Literature, Harvard University. Author of The Uncompleted Past: Postwar German Novels; The Third Reich and the Vanishing Subject: Early Psychology and Literary Modernism.*

GERMAN LITERATURE (in part)

J.R.Z. John R. Zukowsky. *John H. Bryan Curator of Architecture, The Art Institute of Chicago. Author of Chicago Architecture and Design, 1923–1993; Skycrapers: The New Millennium; and others.*

ARCHITECTURE, THE HISTORY OF WESTERN (in part)

J.S. John Scarne (d. 1985). *President, John Scarne Games, Inc., North Bergen, New Jersey. Authority on gambling. Author of Scarne's Complete Guide to Gambling; Scarne on Dice; and others.*

ROULETTE (Micropædia)

J.S.A. James Stephen Atherton (deceased). *Lecturer in English Literature, Wigan and District Mining and Technical College, England. Author of The Books at the Wake.*

JOYCE, JAMES (in part) (Micropædia)

J.S.Ac. James S. Ackerman. *Arthur Kingsley Porter Professor Emeritus of Fine Arts, Harvard University. Author of The Architecture of Michelangelo; Palladio.*

ARCHITECTURE, THE ART OF (in part)

J.S.B. Joe S. Bain (d. 1991). *Professor of Economics, University of California, Berkeley, 1949–75. Author of Industrial Organization; Barriers to New Competition.*

ECONOMIC THEORY (in part)

J.S.Bo. John S. Bowman. *Freelance writer and editor. Editor, "Monuments of Civilization" Series. Author of Traveler's Guide to Crete.*

CYPRUS (in part)

GREECE (in part)

J.S.Br. The Rev. Joseph Stanislaus Brushser, S.J. (d. 1972). *Professor of History, University of San Francisco, 1968–72. Author of Popes Through the Ages.*

GREGORY VII, SAINT (PAPACY) (Micropædia)

J.Sc. Jefim H. Schirmann (d. 1981). *Professor of Hebrew Literature, Hebrew University of Jerusalem. Member, Israel*

National Academy of Sciences. Author of *The Hebrew Poetry in Spain and Provence*.
JUDAH HA-LEVI (Micropædia)

J.Sch. Johannes Schregle. *Honorary President, International Society for Labour Law and Social Security. Honorary Professor of International and Comparative Labour Law, University of Salzburg, Austria. Former Director of Industrial Relations, International Labour Office, International Labour Organisation, Geneva. Author of Negotiating Development: Labour Relations in Southern Asia.*

BUSINESS LAW (in part)

J.S.D. John S. Driscoll. *Editor, Boston Globe.*

UNITED STATES OF AMERICA (in part)

J.Se. Jakob Seibert. *Professor of Ancient History, Ludwig Maximilian University of Munich. Author of Historische Beiträge zu den dynastischen Verbindungen in hellenistischer Zeit and others.*

SELEUCUS I NICATOR (Micropædia)

J.S.E. John S. Ezell. *David Ross Boyd Professor Emeritus of History, University of Oklahoma, Norman. Author of The South Since 1865.*

UNITED STATES OF AMERICA (in part)

J.S.F. Jeffrey S. Fedan. *Research Pharmacologist, National Institute for Occupational Safety and Health, Morgantown, West Virginia. Professor of Pharmacology and Toxicology, West Virginia University, Morgantown.*

DRUGS AND DRUG ACTION (in part)

J.Sh. Jose Shercliff (deceased). *Lisbon Correspondent of The Times (London), and the British Broadcasting Corporation.*

PORTUGAL (in part)

J.Shi. James Shiel. *Former Reader in the History of Hellenic Thought, University of Sussex, Brighton, England. Author of Greek Thought and the Rise of Christianity.*

BOETHIUS, ANICIUS MANLIUS SEVERINUS (Micropædia)

J.Si. Josef Silverstein. *Emeritus Professor of Political Science, Rutgers University, New Brunswick, New Jersey. Author of Burma: Military Rule and the Politics of Stagnation and others.*

SOUTHEAST ASIA (in part)

J.S.K. James S. Kus. *Professor of Geography, California State University, Fresno.*

PERU (in part)

J.S.L. James S. Lehnert. *Associate Professor of Electrical and Computer Engineering, Purdue University, West Lafayette, Indiana. Author of Direct-Sequence Spread-Spectrum Signaling with Applications to Packet Radio Systems.*

TELECOMMUNICATIONS SYSTEMS (in part)

J.Sm. Jim Smyth. *Professor of Sociology, Queen's University, Belfast, Northern Ireland.*

UNITED KINGDOM (in part)

J.S.M. John S. Mathis. *Professor of Astronomy, University of Wisconsin, Madison.*

NEBULA

J.S.Ma. John S. Marshall (d. 1979). *Professor of Philosophy, University of the South, Sewanee, Tennessee, 1946–68. Author of Hooker's Polity in Modern English; Hooker and the Anglican Tradition.*

HOOKE, RICHARD (Micropædia)

J.S.McE. The Rev. James Stevenson McEwen (d. 1993). *Professor of Church History, University of Aberdeen, Scotland, 1958–77. Author of The Faith of John Knox.*

KNOX, JOHN (in part) (Micropædia)

J.S.R. John S. Ryland. *Professor of Marine Biology, University of Wales Swansea. Author of Bryozoans.*

MOSS ANIMALS

J.S.Ri. John S. Richardson. *Professor of Classics, University of Edinburgh. Author of Hispania: Spain and the Development of Roman Imperialism, 218–82 B.C.*

SPAIN (in part)

J.S.Ro. James Scott Robson, M.D. *Emeritus Professor of Medicine, University of Edinburgh; Consultant Physician, Edinburgh Royal Infirmary. Author of numerous articles on acid-base and electrolyte metabolism and renal disorders.*

EXCRETION AND EXCRETORY SYSTEMS (in part)

J.S.-Sm. James Stuart-Smith. *Judge Advocate General of the United Kingdom, 1984–91. Honorary President, International Society for Military Law and the Law of War. Contributor to Law Quarterly Review.*

WAR, THE THEORY AND CONDUCT OF (in part)

J.S.Sz. Joseph S. Szylowicz. *Professor of International Relations, University of Denver, Colorado. Author of Education and Modernization in the Middle East.*

EDUCATION, HISTORY OF (in part)

J.S.T. Joseph S. Tulchin. *Professor of History, University of North Carolina at Chapel Hill. Coeditor of Latin America in World Politics.*

BUENOS AIRES (in part)

J.Ste. Johannes Steudel (d. 1973). *Professor of the History of Medicine, Rhenish Friedrich Wilhelm University of Bonn, West Germany.*

MÜLLER, JOHANNES PETER (Micropædia)

J.Sum. Sir John Summerson (d. 1992). *Curator, Sir John Soane's House and Museum, London, 1945–84. Author of Inigo Jones; Sir Christopher Wren.*

JONES, INIGO (Micropædia)

WREN, SIR CHRISTOPHER (in part)

(Micropædia)

J.S.W. John Steven Watson (d. 1986). *Principal and Vice-Chancellor, University of St. Andrews, Scotland, 1966–86. Author of The Reign of George III.*

GEORGE III (GREAT BRITAIN) (Micropædia)

J.T. John Taylor. *Fellow, Centre for Aboriginal Economic Policy Research,*

Australian National University, Canberra. Author of Immigration and Its Labour Market Impact in the Northern Territory.

AUSTRALIA (in part)

J.T.B. Joseph T. Butler. *Senior Museum Director Emeritus, Historic Hudson Valley, Tarrytown, New York. Author of American Antiques 1800–1900 and others.*

DECORATIVE ARTS AND FURNISHINGS (in part)

J.T.Bo. John Tyler Bonner. *George M. Moffett Professor Emeritus of Biology, Princeton University. Author of The Evolution of Complexity by Means of Natural Selection and others.*

REPRODUCTION AND REPRODUCTIVE SYSTEMS (in part)

J.T.C. J. Terry Copp. *Professor of History, Wilfrid Laurier University, Waterloo, Ontario. Coauthor of Confederation: 1867 and others.*

BORDEN, SIR ROBERT (Micropædia)

J.T.Ca. James T. Campbell. *Assistant Professor of History, Northwestern University, Evanston, Illinois. Author of Songs of Zion: The African Methodist Episcopal Church in the United States and South Africa.*

JOHANNESBURG (in part)

J.T.C.L. James T.C. Liu (deceased). *Professor of History and of East Asian Studies, Princeton University. Author of China Turning Inward and others.*

CHINA (in part)

J.T.F. Jan Terje Faarlund. *Professor of Scandinavian Linguistics, University of Trondheim, Norway. Author of Syntactic Change: Toward a Theory of Historical Syntax and others.*

LANGUAGES OF THE WORLD (in part)

J.Th. John Patrick Thomas. *Singer and composer. Director of Vocal Studies, Stage School of Music, Dance, and Drama, Hamburg, Germany.*

MUSIC, THE ART OF (in part)

J.T.H. James T. Harris. *Former Regional Representative for West Africa (Lagos, Nigeria) for the African-American Institute, New York City.*

UNITED STATES OF AMERICA (in part)

J.T.M. Joe T. Marshall. *Zoologist, National Biological Service, National Museum of Natural History, Washington, D.C. Coauthor of Birds of Arizona.*

BIRDS (in part)

J.T.Mi. John T. Mickel. *Curator of Ferns, New York Botanical Garden, Bronx. Author of The Home Gardener's Book of Ferns; How to Know the Ferns and Fern Allies.*

FERNS (in part)

J.T.Pa. John T. Paoletti. *Professor of Art History, Wesleyan University, Middletown, Connecticut.*

UCCELLO, PAOLO (Micropædia)

J.Tr. Jacques Truchet. *Emeritus Professor of French Literature, University of Paris IV. Author of La Prédication de Bossuet and others.*

BOSSUET, JACQUES-BENIGNE (in part) (Micropædia)

J.T.S. **James T. Staley.** *Corporate Consultant and Chief Scientist, Aerospace and Industrial Products, Alcoa Technical Center, Aluminum Company of America, Alcoa Center, Pennsylvania.*

INDUSTRIES, EXTRACTION AND PROCESSING (in part)

J.T.Sa. **Jeffrey T. Sammons.** *Professor of History, New York University, New York City. Author of Beyond the Ring: The Role of Boxing in American Society.*

BOXING (in part)

J.T.Sc. **Jacob T. Schwartz.** *Chairman, Department of Computer Science, Courant Institute of Mathematical Sciences, New York University, New York City. Author of Mathematical Methods in Analytical Economics; coauthor of Linear Operators.*

ANALYSIS (IN MATHEMATICS) (in part)

J.T.U. **James T. Ulak.** *Curator of Japanese Art, Freer Gallery of Art and Arthur M. Sakler Gallery, Smithsonian Institution, Washington, D.C. Coauthor of Asian Art in the Art Institute of Chicago; Reflections of Reality in Japanese Art.*

EAST ASIAN ARTS (in part)

J.U. **Jürgen Untermann.** *Former Professor of Comparative Philology, University of Cologne. Author of Die venetischen Personennamen und others.*

LANGUAGES OF THE WORLD (in part)

Ju.H. **Julius S. Held.** *Emeritus Professor of Art History, Barnard College, Columbia University. Author of Flemish Painting.*

VAN DYCK, SIR ANTHONY (Micropædia)

Ju.S. **Julius Stone** (d. 1985). *Professor of Law, University of New South Wales, Kensington, Australia. Distinguished Professor of Jurisprudence and International Law, University of California Hastings College of Law, San Francisco. Challis Professor of Jurisprudence and International Law, University of Sydney, Australia, 1942–72. Author of The Principle and Function of Law and others.*

PHILOSOPHIES OF THE BRANCHES OF KNOWLEDGE (in part)

Ju.S.B. **Julia S. Berrall.** *Freelance lecturer and writer. Author of Flowers and Table Settings; The Garden: An Illustrated History; A History of Flower Arrangement.*

DECORATIVE ARTS AND FURNISHINGS (in part)

J.v.E. **Josef van Ess.** *Professor of Islamic Studies and Semitic Languages, Eberhard Karl University of Tübingen, Germany. Author of Die Erkenntnislehre des 'Aḡudaddīn al-Ṭai.*

MUḤASIBI, AL- (Micropædia)

J.V.F. **J. Valerie Fifer.** *Honorary Research Fellow, Institute of Latin American Studies, University of London. Author of Bolivia: Land, Location, and Politics since 1825 and others.*

BOLIVIA (in part)

J.V.G. **Juan Vernet Ginés.** *Emeritus Professor of Arabic, University of Barcelona. Author of Ce que la culture doit aux Arabes d'Espagne and others.*

SPAIN (in part)

J.v.H. **Jan S.F. van Hoogstraten.** *Former Chief of Mission, Intergovernmental*

Committee for Migration, Bonn. Former Church World Service Director, Africa Department, National Council of the Churches of Christ in the U.S.A.

CENTRAL AFRICA (in part)

J.Vi. **Jean Vidalenc.** *Former Professor of Contemporary History, University of Rouen, France. Author of Louis Blanc.*

BLANC, LOUIS (Micropædia)

MARAT, JEAN-PAUL (Micropædia)

THIERS, ADOLPHE (Micropædia)

J.V.K. **John V. Killheffer** (d. 1993). *Associate Editor, Science, Encyclopædia Britannica, Chicago, 1971–88.*

INDUSTRIES, CHEMICAL PROCESS (in part)

J.V.M. **John V. Murra.** *President, Institute of Andean Research, New York City. Emeritus Professor of Anthropology, Cornell University, Ithaca, New York. Author of The Economic Organization of the Inka State and others.*

AMERICAN PEOPLES, NATIVE (in part)

PRE-COLUMBIAN CIVILIZATIONS (in part)

J.Vo. **Jack Vowles.** *Senior Lecturer in Political Science and Public Policy, University of Waikato, Hamilton, New Zealand.*

NEW ZEALAND (in part)

J.V.R. **Jan L.R. Van Roey.** *Honorary Archivist, City Archives, Antwerp.*

ANTWERP (in part)

J.V.W. **James V. Warren, M.D.** (d. 1990). *Professor of Medicine, Ohio State University, Columbus, 1961–86. Contributor to Textbook of Medicine; The Heart.*

CIRCULATION AND CIRCULATORY SYSTEMS (in part)

J.W. **Jean Weininger.** *Visiting Scholar, University of California, Berkeley.*

NUTRITION (in part)

J.W.B. **James W. Byrkit.** *Professor of Interdisciplinary Studies and Research Associate, Northern Arizona University, Flagstaff. Author of Forging the Copper Collar: Arizona's Labor-Management War, 1901–1921.*

UNITED STATES OF AMERICA (in part)

J.W.Ba. **John Walton Barker, Jr.** *Professor of History, University of Wisconsin, Madison. Author of Justinian and the Later Roman Empire.*

BELISARIUS (Micropædia)

J.W.C. **John W. Caughey.** *Emeritus Professor of American History, University of California, Los Angeles. Author of McGillivray of the Creeks.*

MCGILLIVRAY, ALEXANDER (Micropædia)

J.We. **Jac Weller** (d. 1994). *Weapons engineer, military historian, and freelance writer. Author of Weapons and Tactics; coauthor of Firearms Investigation, Identification, and Evidence.*

WAR, THE TECHNOLOGY OF (in part)

J.W.F. **J.W. Fiegenbaum.** *Emeritus Professor of Religion, Mount Holyoke College, South Hadley, Massachusetts.*

HALLAJ, AL- (Micropædia)

IBN ḤAZM (Micropædia)

J.W.Fe. **James W. Fernandez.** *Professor of Anthropology, University of Chicago.*

Author of Persuasions and Performances: The Play of Tropes in Culture; editor of Beyond Metaphor: The Theory of Tropes in Anthropology.

SOCIAL SCIENCES (in part)

J.W.H. **Joseph W. Harpster.** *President, Intek Inc., Westerville, Ohio.*

ENERGY CONVERSION (in part)

J.W.Ha. **John W. Harbaugh.** *Professor of Geological Sciences, Stanford University, California. Coauthor of Computer Simulation in Geology.*

EARTH SCIENCES, THE (in part)

J.W.Hu. **John W. Huffman, M.D.** (d. 1989). *Professor of Obstetrics and Gynecology, Medical School, Northwestern University, Chicago, 1962–73. Author of Gynecology and Obstetrics.*

REPRODUCTION AND REPRODUCTIVE SYSTEMS (in part)

J.Wi. **Jody Williams.** *Founding coordinator, International Campaign to Ban Landmines (ICBL), 1992. Nobel Prize for Peace, 1997 (corecipient with ICBL).*

INTERNATIONAL CAMPAIGN TO BAN LANDMINES (Micropædia)

J.W.J. **Jeffrey W. Jacobs.** *Assistant Professor of Geography, Texas A&M University, College Station. Author of International River Basin Development and Climate Change: the Lower Mekong of Southeast Asia.*

ASIA (in part)

J.W.Ja. **John W. James.** *Associate Professor of Geography, University of Nevada, Reno. State Climatologist for Nevada. An authority on the alpine environment.*

NORTH AMERICA (in part)

J.W.K. **John W. Kendrick.** *Emeritus Professor of Economics, George Washington University, Washington, D.C. Former Chief Economist, U.S. Department of Commerce. Author of Productivity Trends in the United States.*

ECONOMIC GROWTH AND PLANNING (in part)

J.W.L. **Justin W. Leonard** (d. 1975). *Professor of Natural Resources and of Zoology; Research Associate, Museum of Zoology, University of Michigan, Ann Arbor, 1964–75. Coauthor of Mayflies of Michigan Trout Streams.*

INSECTS (in part)

J.W.Le. **John Wilson Lewis.** *William Haas Professor of Chinese Politics, Stanford University, California. Author of Leadership in Communist China.*

CHINA (in part)

TAIWAN (in part)

J.W.McF. **James Walter McFarlane.** *Emeritus Professor of European Literature, University of East Anglia, Norwich, England. Author of Ibsen and the Temper of Norwegian Literature; editor, translator of The Oxford Ibsen.*

SCANDINAVIAN LITERATURE (in part)

J.Wo. **John Woodward** (d. 1988). *Keeper, Birmingham City Museum and Art Gallery, Birmingham, England. Author of A Picture History of British Painting.*

REYNOLDS, SIR JOSHUA (Micropædia)

J.W.O. John W. Osborne. *Emeritus Professor of History, Rutgers University, New Brunswick, New Jersey. Author of William Cobbett: His Thoughts and His Times and others.*

COBBETT, WILLIAM (Micropædia)

J.W.R. James Wilmot Rowe. *Economic and international consultant. Former Executive Director, New Zealand Employers' Federation, Wellington. Coauthor of New Zealand.*

NEW ZEALAND (in part)

J.W.R.T. John W.R. Taylor. *Emeritus Editor, Jane's All the World's Aircraft. Author of History of Aerial Warfare.*

WAR, THE TECHNOLOGY OF (in part)

J.W.T. John Walford Todd, M.D. (d. 1989). *Consultant Physician, Frimley Park and Farnham Hospitals, Farnham, England. Author of Health and Humanity.*

MEDICINE (in part)

J.W.Th. John W. Thieret. *Professor of Botany, Northern Kentucky University, Highland Heights. Coauthor of Trees.*

ANGIOSPERMS (in part)

J.W.W. James Wreford Watson (d. 1990). *Professor of Geography, University of Edinburgh, 1954–82. Author of North America: Its Countries and Regions.*

NORTH AMERICA (in part)

J.W.Wr. John Wilfrid Wright. *Land surveyor; freelance writer and lecturer. Author of Ground and Air Survey for Field Scientists.*

MAPPING AND SURVEYING (in part)

J.Y.S. John Y. Simon. *Professor of History, Southern Illinois University, Carbondale. Executive Director, Ulysses S. Grant Association. Editor of The Papers of Ulysses S. Grant.*

GRANT, ULYSSES S. (Micropædia)

J.Z.S. Jonathan Z. Smith. *Robert O. Anderson Distinguished Service Professor of the Humanities, University of Chicago. Author of To Take Place: Toward Theory in Ritual and others.*

EUROPEAN RELIGIONS, ANCIENT (in part)

MYTH AND MYTHOLOGY (in part)

J.Z.V. Josefina Zoraida Vázquez. *Professor of History, College of Mexico, Mexico City. Author of Nacionalismo y educación en México.*

EDUCATION, HISTORY OF (in part)

K.A.B. Kenneth A. Ballhatchet (d. 1995). *Professor of the History of South Asia, School of Oriental and African Studies, University of London. Author of Race, Sex and Class under the Raj.*

AKBAR (Micropædia)

DALHOUSIE, JAMES ANDREW BROWN RAMSAY, MARQUESS AND 10TH EARL OF (Micropædia)

K.A.G. Kent A. Grayson. *Assistant Professor of Marketing, London Business School.*

MARKETING AND MERCHANDISING (in part)

K.A.H. Keith Arnold Hitchins. *Professor of History, University of Illinois at Urbana-Champaign. Author of Rumania 1866–1947.*

BALKAN STATES (in part)

K.A.J.W. Keith Arthur John Wise. *Entomologist, Auckland Institute and Museum, New Zealand.*

INSECTS (in part)

Ka.La. Karl Lavrencic. *Journalist.*

BALKAN STATES (in part)

Ka.M. Kazimieras Meškauskas. *Former Department Chief, Institute of Economics; former Chief Learned Secretary of the Presidium, Lithuanian Academy of Sciences. Author of Soviet Lithuania.*

BALTIC STATES (in part)

K.A.Mi. Karen A. Mingst. *Professor of Political Science, University of Kentucky, Lexington. Author of Essentials of International Relations; coauthor of The United Nations in the Post-Cold War Era.*

INTERNATIONAL COURT OF JUSTICE AND INTERNATIONAL ORGANIZATION (Micropædia)

UNITED NATIONS (in part)

UNITED NATIONS PEACEKEEPING FORCES (Micropædia)

K.An. Kym Anderson. *Professor of Economics and Foundation Director, Centre for International Economic Studies, University of Adelaide, Australia. Author of numerous monographs on the WTO, including Vietnam's Transforming Economy and WTO Accession: Implications for Agriculture and Rural Development and others.*

WORLD TRADE ORGANIZATION (Micropædia)

K.A.R. Karl A. Roider, Jr. *Professor of History; Dean, College of Arts and Sciences, Louisiana State University, Baton Rouge. Author of Austria's Eastern Question and others.*

AUSTRIA (in part)

K.A.S. Kaj Aa. Strand. *Scientific Director, U.S. Naval Observatory, Washington, D.C., 1963–77. Editor of Basic Astronomical Data; Vistas in Astronomy.*

PARALLAX (in part) (Micropædia)

K.A.Sc. Karl A. Schleunes. *Professor of History, University of North Carolina at Greensboro. Author of The Twisted Road to Auschwitz.*

GERMANY (in part)

K.A.Si. Karl A. Sinnhuber. *Emeritus Professor of Economic Geography, Vienna University of Economics and Business Administration. Author of Germany, Its Geography and Growth.*

EUROPE (in part)

K.A.St. Kaydon Al Stanzione. *Former Senior Engineer, Advanced Vehicle Aerodynamics, Boeing Vertol Company, Philadelphia.*

ENGINEERING (in part)

K.A.W.C. Keith A.W. Crook. *Science Director, Hawaii Undersea Research Laboratory, National Undersea Research Center, National Oceanic and Atmospheric Administration, University of Hawaii at Manoa, Honolulu. Coauthor of Geological Evolution of Australia and New Zealand.*

MINERALS AND ROCKS (in part)

K.B. Knut Bergsland. *Emeritus Professor of Finno-Ugric Languages, University of Oslo, Norway. Scholar who proved the*

connection between the Eskimo and Aleut languages. Author of Aleut Dictionary.

LANGUAGES OF THE WORLD (in part)

K.B.D. Kwamina Busumafi Dickson (d. 1992). *Vice-Chancellor, University of Cape Coast, Ghana. Author of A Historical Geography of Ghana.*

AFRICA (in part)

K.Be. Karl Beckson. *Professor of English, Brooklyn College, City University of New York. Editor of Aesthetes and Decadents of the 1890's; Oscar Wilde: The Critical Heritage.*

WILDE, OSCAR (Micropædia)

K.-b.L. Ki-baik Lee. *Former Professor of History, Sogang University, Seoul, Korea. Author of Hankuksa sillon.*

KOREA (in part)

K.B.M. Kathleen Berton Murrell. *Researcher on the history of Moscow. Author of Moscow: An Architectural History; Moscow Revealed; and others.*

MOSCOW (in part)

K.Br. Sir Kenneth Bradley (d. 1977). *Director, Commonwealth Institute, London, 1953–69.*

SOUTHERN AFRICA (in part)

K.C. Kimberly Cowell-Myers. *Professor of Government, American University, Washington, D.C.*

ADAMS, GERRY (in part) (Micropædia)

HUME, JOHN (in part) (Micropædia)

IRISH REPUBLICAN ARMY (in part) (Micropædia)

SINN FÉIN (in part) (Micropædia)

TRIMBLE, DAVID (in part) (Micropædia)

K.C.B. Kevin Charles Beck. *Associate Professor of Earth and Atmospheric Sciences, Georgia Institute of Technology, Atlanta. Coauthor of Clay Water Diagenesis During Burial: How Mud Becomes Gneiss.*

MINERALS AND ROCKS (in part)

K.C.C. Karine Carole Chemla. *Research staff member, National Centre for Scientific Research, Paris. Editor of "Démarches mathématiques" in Encyclopédie Philosophique Universelle.*

MATHEMATICS, THE HISTORY OF (in part)

K.-c.H. Kung-chuan Hsiao (d. 1981). *Professor of the History of Chinese Thought, University of Washington, Seattle, 1959–68. Author of Rural China: Imperial Control in the 19th Century.*

HAN-FEL-TZU (Micropædia)

K.C.P. Kenneth C. Parkes. *Senior Curator of Birds, Carnegie Museum of Natural History, Pittsburgh, Pennsylvania. Author of numerous articles on the biology and systematics of birds.*

BIRDS (in part)

K.D. Keith Dorwick. *Assistant Professor of Rhetoric and Computer Communications, University of Louisiana at Lafayette.*

AIDS (in part) (Micropædia)

HOMOSEXUALITY (in part) (Micropædia)

SEX AND SEXUALITY (in part)

K.-D.G. Karl-Dietrich Gundermann (d. 1995). *Professor of Organic Chemistry, Technical University of Clausthal, Germany, 1964–88. Author of*

Chemilumineszenz organischer Verbindungen.

LIGHT (in part)

Ke.B. **Kenneth Barkin.** *Professor of History, University of California, Riverside. Author of The Controversy over German Industrialization, 1890–1902.*

BISMARCK

GERMANY (in part)

K.E.Bo. **Kenneth E. Boulding** (d. 1993). *Distinguished Professor of Economics, University of Colorado, Boulder, 1977–80. Author of Economics as a Science; Ecodynamics: A New Theory of Societal Evolution.*

ECONOMIC THEORY (in part)

K.E.C. **Kathleen Elizabeth Conlan.** *Research Scientist, Research Division, Canadian Museum of Nature, Ottawa. CRUSTACEANS (in part)*

K.E.H. **Kenneth E. Hofer, Jr.** *Vice President, L. J. Broutman and Associates, Ltd., Chicago. Former Senior Research Engineer, Materials Engineering, IIT Research Institute, Chicago.*

ANALYSIS AND MEASUREMENT, PHYSICAL AND CHEMICAL (in part)

K.E.N. **Kai E. Nielsen.** *Emeritus Professor of Philosophy, University of Calgary, Alberta. Author of Scepticism. RELIGIOUS AND SPIRITUAL BELIEF, SYSTEMS OF (in part)*

K.E.P. **Kenyon Edwards Poole** (d. 1988). *Professor of Economics, Northwestern University, Evanston, Illinois. Author of Public Finance and Economic Welfare. GOVERNMENT FINANCE (in part)*

Ke.S. **Sir Keith Sinclair** (d. 1993). *Professor of History, University of Auckland, New Zealand, 1963–87. Author of A History of New Zealand. NEW ZEALAND (in part)*

K.E.W. **Kempton E. Webb.** *Emeritus Professor of Geography, Columbia University. Author of The Changing Face of Northeast Brazil. SOUTH AMERICA (in part)*

K.F. **Ken Frieden.** *B.G. Rudolph Professor of Judaic Studies at Syracuse University, New York. Author of Classic Yiddish Fiction: Abramovitsh, Sholem Aleichem and Peretz. YIDDISH LITERATURE (in part)*

K.F.J. **Kenneth F. Janda.** *Professor of Political Science, Northwestern University, Evanston, Illinois. Author of Political Parties: A Cross-national Survey. POLITICAL PARTIES AND INTEREST GROUPS (in part)*

K.G. **Karl Geiringer** (d. 1989). *Professor of Music, University of California, Santa Barbara, 1962–73. Coauthor of Haydn: A Creative Life in Music. BRAHMS, JOHANNES (in part) (Micropædia) HAYDN, JOSEPH (in part) (Micropædia)*

K.G.L. **Kenneth G. Lieberthal.** *Arthur F. Thurnau Professor and Professor of Political Science; Research Associate, Center for Chinese Studies, University of Michigan, Ann Arbor. Author of Governing China and others.*

CHINA (in part)

CULTURAL REVOLUTION (Micropædia)

K.G.R. **Kenneth Grahame Rea.** *Theatre critic and playwright. Lecturer and Tutor in Drama, Guildhall School of Music and Drama, London.*

THEATRE, THE HISTORY OF WESTERN

K.Hä. **Karl H. Häuser.** *Emeritus Professor of Political Economy, Johann Wolfgang Goethe University of Frankfurt, Frankfurt am Main, Germany. Coauthor of The German Economy, 1870 to the Present.*

TAXATION (in part)

K.H.C. **Kenneth H. Cooper, M.D.** *President and Founder, The Cooper Aerobics Center, Dallas, Texas. Author of The Aerobics Program for Total Well-being and others.*

EXERCISE AND PHYSICAL CONDITIONING (in part)

K.H.D.H. **K.H.D. Haley.** *Emeritus Professor of Modern History, University of Sheffield, England. Author of The First Earl of Shaftesbury.*

SHAFTESBURY, ANTHONY ASHLEY COOPER, 1ST EARL OF (Micropædia)

K.H.L. **Karl Heinz Lüling** (d. 1984). *Chairman, Department of Ichthyology, Zoological Research Institute and Alexander Koenig Museum, Bonn, West Germany. Researcher on the physiology and behaviour of lungfishes. FISHES (in part)*

K.H.M. **Kenneth H. Mann.** *Emeritus Research Scientist; Director, Marine Ecology Laboratory, Bedford Institute of Oceanography, Fisheries and Oceans Canada, Dartmouth, Nova Scotia, 1980–87. Author of Ecology of Coastal Waters: A Systems Approach. BIOSPHERE AND CONCEPTS OF ECOLOGY, THE (in part)*

Kh.Mo. **Khosrow Mostofi** (d. 1992). *Professor of Political Science, University of Utah, Salt Lake City, 1970–87; Director, Middle East Languages and Area Center, 1967–83. Author of Aspects of Nationalism: A Sociology of Colonial Revolt. IRAN (in part)*

K.Ho. **Keigo Hogetsu.** *Honorary Professor of Literature, University of Tokyo. Author of Nihon shi gairon. TAIRA FAMILY (Micropædia)*

K.I. **Kristen Iversen.** *Assistant Professor, San Jose State University. Author of Molly Brown: Unraveling the Myth. BROWN, MARGARET TOBIN (Micropædia)*

K.I.K. **Kenneth I. Kellermann.** *Senior Scientist, National Radio Astronomy Observatory, Charlottesville, Virginia. Coeditor of Galactic and Extragalactic Radio Astronomy. TELESCOPES (in part)*

K.In. **Kenneth Ingham.** *Emeritus Professor of History, University of Bristol, England. Author of A History of East Africa and others.*

EASTERN AFRICA (in part)

SOUTHERN AFRICA (in part)

K.Iw. **Kenkichi Iwasawa.** *H.B. Fine Professor Emeritus of Mathematics, Princeton University. Author of Lectures on p-adic L-functions.*

ANALYSIS (IN MATHEMATICS) (in part)

K.J. **Karl H.E. Jordan** (d. 1984). *Professor of Medieval and Modern History, Christian Albrecht University of Kiel, West Germany. Editor of Die Urkunden Heinrichs des Löwen. HENRY III (SAXONY) (Micropædia)*

K.Ja. **Krzysztof Jasiewicz.** *Professor of Sociology, Washington and Lee University, Lexington, Virginia. POLAND (in part)*

K.J.B. **Keith J. Beven.** *Reader in Environmental Science, University of Lancaster, England. EARTH SCIENCES, THE (in part)*

K.J.C. **Kenneth J. Carpenter.** *Professor Emeritus of Nutrition, University of California, Berkeley. NUTRITION (in part)*

K.J.DeW. **Kenneth J. DeWoskin.** *Professor of Chinese, University of Michigan, Ann Arbor. Author of A Song for One or Two: Music and the Concept of Art in Early China and others. CHINA (in part)*

K.J.Hi. **K. Jaakko J. Hintikka.** *Professor of Philosophy, Boston University. Author of Logic, Language-Games and Information. PHILOSOPHIES OF THE BRANCHES OF KNOWLEDGE (in part)*

K.J.L. **K.J. Leyser** (d. 1992). *Chichele Professor Emeritus of Medieval History, University of Oxford, 1984–88. Author of Medieval Germany and Its Neighbours, 900–1250. GERMANY (in part)*

K.J.N. **Karl J. Narr.** *Emeritus Professor of Prehistory and Protohistory, University of Münster, Germany. PREHISTORIC PEOPLES AND CULTURES (in part)*

K.J.No. **Knut J. Norstog.** *Research Associate, Fairchild Tropical Garden, Miami, Florida, 1978–89. Coauthor of Plant Biology. GYMNOSPERMS (in part)*

K.J.R. **Kenneth John Rea.** *Professor of Economics, University of Toronto. Author of The Political Economy of the Canadian North. CANADA (in part)*

K.K. **Kumar Krishna.** *Research Associate, Department of Entomology, American Museum of Natural History, New York City. Professor of Biology, City College and Graduate School, City University of New York. Coeditor of Biology of Termites. INSECTS (in part)*

K.La. **Kenneth Lamott** (d. 1979). *Novelist and journalist. Author of Anti-California and numerous other books and magazine articles. SAN FRANCISCO (in part)*

K.L.J. **Karen L. Jolly.** *Associate Professor of History, University of Hawaii at Manoa. Author of Popular Religion in Late Saxon England: Elf Charms in*

Context; *editor of Tradition and Diversity: European Christianity in a World Context to 1500.*

OCCULTISM (in part)

K.L.K.L. Kai L.K. Laitinen. *Professor of Finnish Literature, University of Helsinki, 1982–89. Author of Literature of Finland.*
FINNISH LITERATURE (Micropædia)

K.L.N. Kenneth L. Nordtvedt, Jr. *Emeritus Professor of Physics, Montana State University, Bozeman.*
GRAVITATION (in part)

K.Lo. Dame Kathleen Lonsdale (d. 1971). *Professor of Chemistry, University of London, 1949–68. Editor and part author of International Tables for X-Ray Crystallography (vol. 1–3).*
BRAGG, SIR LAWRENCE (Micropædia)
BRAGG, SIR WILLIAM (Micropædia)

K.L.W. King Lit Wong. *Senior Research Scientist in Toxicology, Krug International, Lyndon B. Johnson Space Center, Houston, Texas.*
POISONS AND POISONING (in part)

K.M. Kathy Mezei. *Professor and Chair, Department of English, Simon Fraser University, Burnaby, British Columbia. Author of Bibliography of Criticism on English and French Literary Translations in Canada.*
CANADIAN LITERATURE (in part)

K.Ma. Kitajima Masamoto. *Former Professor of Japanese History, Tokyo Metropolitan University. Author of Structure of Power in the Edo Shogunate.*
JAPAN (in part)

K.M.A.G. Kurt Moritz Artur Goldammer. *Professor of Comparative History of Religions and of the History of Religious Art, Philipps University of Marburg, Germany. Author of Kultsymbolik des Protestantismus.*
RELIGIOUS SYMBOLISM AND ICONOGRAPHY

K.M.B. Kathleen M. Baker. *Lecturer in Geography, School of Oriental and African Studies, University of London. Author of Agricultural Change in Nigeria.*
WESTERN AFRICA (in part)

K.Me. Kenneth Mellanby (d. 1993). *Director, Monks Wood Experimental Station, Huntingdon, England, 1961–74. Author of Farming and Wildlife and others.*
AGRICULTURE, THE HISTORY OF (in part)

K.M.G.P. Kings Mbacazwa G. Phiri. *Associate Professor of History, University of Malawi, Zomba.*
SOUTHERN AFRICA (in part)

K.Mi. Kenneth R. Minogue. *Emeritus Professor of Political Science, London School of Economics and Political Science. Author of Politics: A Very Short Introduction and others.*
SOCIO-ECONOMIC DOCTRINES AND REFORM MOVEMENTS, MODERN (in part)

K.M.K. Dame Kathleen Mary Kenyon (d. 1978). *Principal, St. Hugh's College, University of Oxford, 1962–73. Director, British School of Archaeology in Jerusalem, 1951–66. Author of Archaeology in the Holy Land; Digging Up Jericho; and others.*
PALESTINE (in part)

K.M.L. Kathleen Marguerite Lea (d. 1995). *Fellow of Lady Margaret Hall, University of Oxford, 1937–71; Vice-Principal of Lady Margaret Hall, Oxford, 1947–71.*
BACON, FRANCIS (in part)

K.M.S. Kazimierz Maciej Smogorzewski (d. 1992). *Freelance writer on contemporary history. London Correspondent, Kurier Polski (Warsaw), 1957–81. Founder and Editor, Free Europe, 1939–45. Author of Joseph Pilsudski, soldat de la Pologne restaurée and others.*
BALTIC STATES (in part)
PIŁSUDSKI, JÓZEF (Micropædia)

K.M.W. Karl M. Waage. *Emeritus Professor of Geology; Emeritus Curator of Invertebrate Paleontology, Peabody Museum of Natural History, Yale University. Coauthor of Historical Geology.*
DANA, JAMES D. (Micropædia)

K.N. Keiji Nagahara. *Professor of History, Hitotsubashi University, Tokyo. Author of Minamoto no Yoritomo.*
MINAMOTO YORITOMO (Micropædia)

K.Na. Kusum Nair (deceased). *Former Visiting Professor, Department of Economics, University of Maryland, College Park. Author of The Lonely Furrow: Farming in the United States, Japan, and India and others.*
AGRICULTURE, THE HISTORY OF (in part)

K.N.L. Karl Nickerson Llewellyn (d. 1962). *Professor of Law, University of Chicago, 1951–62.*
MANSFIELD, WILLIAM MURRAY, 1ST EARL OF (Micropædia)

K.Ob. Kalervo Oberg (d. 1973). *Professor of Anthropology, Oregon State University, Corvallis. Author of Indian Tribes of Northern Mato Grosso, Brazil.*
AMERICAN PEOPLES, NATIVE (in part)

K.O.v.A. Karl Otmar, Baron von Aretin. *Head Editor, Neue Deutsch Biographie. Emeritus Professor of Contemporary History, Technical University of Darmstadt, Germany. Former Director, Institute for European History, Mainz, Germany.*
FRANCIS JOSEPH (Micropædia)
METTERNICH, KLEMENS, FÜRST VON (in part) (Micropædia)

K.P. Kevin Padian. *Professor of Integrative Biology; Curator of Museum of Paleontology, University of California, Berkeley. Editor of Encyclopedia of Dinosaurs.*
DINOSAUR (in part)

K.P.S. Karl Patterson Schmidt (d. 1957). *Chief Curator of Zoology, Field Museum of Natural History, Chicago, 1941–55.*
CHINA (in part)
UNITED STATES OF AMERICA (in part)

K.R. Kenneth S. Rothwell. *Emeritus Professor of English, University of Vermont, Burlington. Author of A History of Shakespeare on Screen; coauthor of Shakespeare on Screen: An International Filmography and Videography.*
SHAKESPEARE (in part)

K.R.D. K.R. Dikshit. *Honorary Editor, Transactions of the Institute of Indian Geographers; former Professor of Geography, University of Poona, Pune. Author of Environment, Forest Ecology and Man in the Western Ghats and others.*
INDIA (in part)

K.Re. Kenneth Rexroth (d. 1982). *Poet, writer, and painter. Special Lecturer, University of California, Santa Barbara. Author of Classics Revisited and others.*
LITERATURE, THE ART OF (in part)

Kr.K. Krishan Kumar. *Professor of Social and Political Thought, University of Kent at Canterbury, England. Author of Prophecy and Progress and others.*
MODERNIZATION AND INDUSTRIALIZATION

K.-r.L. Kwang-rin Lee. *Professor of History, Sogang University, Seoul, South Korea. Author of History of Enlightenment in Korea.*
KOREA (in part)

K.R.R. Kenneth R. Robertson. *Botanist, Illinois Natural History Survey; Affiliate in Plant Biology, University of Illinois at Urbana-Champaign. Author of Observing, Photographing, and Collecting Plants.*
ANGIOSPERMS (in part)

K.R.S. Kenneth Reginald Sturley. *Professor of Telecommunications, Ahmadu Bello University, Zaria, Nigeria, 1968–71. Chief Engineer, External Broadcasting, British Broadcasting Corporation, London, 1963–68. Author of Radio Receiver Design and others.*
BROADCASTING (in part)

K.R.St. Karl R. Stadler (d. 1987). *Professor and Head, Institute of Modern and Contemporary History, Johannes Kepler University of Linz, Austria. Author of The Birth of the Austrian Republic.*
AUSTRIA (in part)

K.R.V.H. Kent R. Van Horn (d. 1989). *Vice President, Research and Development, Aluminum Company of America, Pittsburgh, 1962–70; Research Metallurgist, 1929–62. Coauthor of Aluminum in Iron and Steel.*
INDUSTRIES, EXTRACTION AND PROCESSING (in part)

K.S. Khushwant Singh. *Freelance journalist. Former Member, Rajya Sabha (upper house of the Indian Parliament). Author of A History of the Sikhs and others.*
SIKHISM

K.S.A.J. Kamel S. Abu Jaber. *Senator, Parliament of Jordan; Minister of Foreign Affairs, 1991–93. Emeritus Professor of Political Science, University of Jordan, Amman. Author of The Jordanians and the People of Jordan and others.*
JORDAN (in part)

K.S.B. Karl S. Bottigheimer. *Professor of History, State University of New York at Stony Brook. Author of Ireland and the Irish and others.*
UNITED KINGDOM (in part)

K.S.C. Ken S. Coates. *Professor of History, University of Waikato, Hamilton, New Zealand. Coauthor of Manitoba: The Province and the People.*
CANADA (in part)

K.S.D. Keith S. Donnellan. *Professor of Philosophy, University of California, Los Angeles. Author of articles in various philosophical journals, particularly on the theory of reference.*

PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (in part)

K.Si. Kate Silber (deceased). *Senior Lecturer in German, University of Edinburgh, 1963–73. Author of Pestalozzi: The Man and His Work.*

PESTALOZZI, JOHANN HEINRICH (in part) (Micropædia)

K.S.L. Kenneth S. Lane (d. 1993). *Consulting engineer for dams and tunnels, and soils and rock engineering. Editor of Proceedings of the North American Rapid Excavating and Tunneling Conference, 1972; Proceedings of the ASCE symposium on Underground Rock Chambers, 1971.*

PUBLIC WORKS (in part)

K.Sm. The Rev. Kevin Smyth. *Former Professor of Scripture, Milltown Park, Dublin.*

ELIJAH (in part) (Micropædia)

K.S.N. Kenneth Stafford Norris. *Emeritus Professor of Natural History, University of California, Santa Cruz. Coauthor of The Hawaiian Spinner Dolphin; editor of Whales, Dolphins and Porpoises.*

MAMMALS (in part)

K.S.S. Kamal Suleiman Salibi. *Professor of History, American University of Beirut, Lebanon. Author of The Modern History of Lebanon and others.*

BEIRUT

SYRIA (in part)

K.St. The Rev. Krister Stendahl. *Bishop of Stockholm, 1984–88. Andrew W. Mellon Professor of Divinity, Harvard University, 1981–84; Dean, Divinity School, 1968–79. Author of Paul Among Jews and Gentiles.*

BIBLICAL LITERATURE AND ITS CRITICAL INTERPRETATION (in part)

K.Su. Keith Sutton. *Senior Lecturer in Geography, Victoria University of Manchester, England. Contributor to various journals dealing with geography, Africa, and the Third World.*

NORTH AFRICA (in part)

K.S.W. Kathrine Sorley Walker. *Freelance writer, editor, and dance critic. Author of Dance and Its Creators.*

BALANCHINE, GEORGE (Micropædia)

FOKINE, MICHEL (Micropædia)

PAVLOVA, ANNA (Micropædia)

K.T.B. Konstantin Trifonovich Bogdanov. *Head, Thermic and Dynamic Ocean Department, Pacific Oceanology Institute, Russian Academy of Sciences, Vladivostok.*

PACIFIC OCEAN, THE (in part)

Ku.N. Kurt Nassau. *Consultant. Research Scientist, AT&T Bell Laboratories, Murray Hill, New Jersey, 1959–89. Author of The Physics and Chemistry of Color.*

COLOUR

Ku.R. Kurt Reindel. *Professor of History, University of Regensburg, Germany.*

OTTO I (GERMANY/HOLY ROMAN EMPIRE) (Micropædia)

K.v.Fr. Kurt von Fritz (d. 1985). *Professor of Classical Philosophy, Ludwig Maximilian University of Munich, West Germany. Author of Die griechische Geschichtsschreibung (vol. 1) and numerous others.*

PHILOSOPHY, THE HISTORY OF WESTERN (in part)

K.V.J.v.F. Kai V.J. von Fieandt. *Emeritus Professor of Psychology, University of Helsinki, Finland. Author of The World of Perception.*

PERCEPTION, HUMAN (in part)

K.V.Su. K.V. Sundaram. *Consultant, Food and Agriculture Organization, United Nations, Rome.*

DELHI (in part)

K.V.Z. Kamil V. Zvelebil. *Professor of Dravidology, State University of Utrecht, The Netherlands. Author of Comparative Dravidian Phonology.*

LANGUAGES OF THE WORLD (in part)

K.W.B. Karl W. Butzer. *Dickson Centennial Professor of Liberal Arts, University of Texas at Austin. Specialist on the interrelationships among environment, prehistoric cultures, and human evolution. Author of Environment and Archeology; coauthor of Desert and River in Nubia.*

CLIMATE AND WEATHER (in part)

K.W.Bo. Kees W. Bolle. *Professor of History, University of California, Los Angeles. Author of The Freedom of Man in Myth.*

MYTH AND MYTHOLOGY (in part)

K.W.Br. Kenneth W. Britt. *Senior Research Associate, Empire State Paper Research Institute, State University of New York College of Environmental Science and Forestry, Syracuse. Editor of Handbook of Pulp and Paper Technology.*

INDUSTRIES, CHEMICAL PROCESS (in part)

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THACKERAY, WILLIAM MAKEPEACE (in part) (Micropædia)

La.B.S. Lacey Baldwin Smith. *Peter B. Ritzma Professor Emeritus of Humanities, Northwestern University, Evanston, Illinois. Author of Treason in Tudor England and others.*

UNITED KINGDOM (in part)

L.A.C. Lewis A. Coser. *Distinguished Professor Emeritus of Sociology, State University of New York at Stony Brook. Author of The Functions of Social Conflict.*

SOCIO-ECONOMIC DOCTRINES AND REFORM MOVEMENTS, MODERN (in part)

L.A.Cr. Lawrence A. Cremin (d. 1990). *Frederick A.P. Barnard Professor of Education, Teachers College, Columbia University, 1961–90. Author of American Education: The National Experience and others.*

MANN, HORACE (Micropædia)

La.G. Sir Lawrence Gowing (d. 1991). *Slade Professor of Fine Art, University College, University of London, 1975–85. Author of Vermeer; Turner; Imagination and Reality.*

PAINTING, THE HISTORY OF WESTERN (in part)

SCULPTURE, THE HISTORY OF WESTERN (in part)

L.A.G. Louis A. Girifalco. *University Professor of Materials Science, University of Pennsylvania, Philadelphia. Author of Dynamics of Technological Change.*

MATERIALS SCIENCE (in part)

L.A.H. Lubomyr A. Hajda. *Associate Director, Harvard Ukrainian Research Institute, Harvard University. Coeditor of The Nationalities Factor in Soviet Politics and Society.*

UKRAINE (in part)

La.L. Laurence Elliot Libin. *Frederick P. Rose Curator of Musical Instruments, Metropolitan Museum of Art, New York City. Author of American Musical Instruments in The Metropolitan Museum of Art.*

MUSICAL FORMS AND GENRES (in part)

MUSICAL INSTRUMENTS (in part)

L.-A.L. Luce-Andrée Langevin. *Honorary Professor; former teacher of physical science, Lycée Fénélon, Paris. Author of Lomonosov.*

LOMONOSOV, MIKHAIL VASILYEVICH (Micropædia)

L.A.M. Leslie A. Marchand. *Emeritus Professor of English, Rutgers University, New Brunswick, New Jersey. Author of Byron: A Biography and others; editor of Byron's Letters and Journals.*

BYRON, GEORGE GORDON BYRON, 6TH BARON (in part) (Micropædia)

L.A.Ma. L. Andrew Mannheim (d. 1990). *Technical editor, writer, and consultant. Author of Leica Way and others; editor of Focal Encyclopedia of Photography.*

PHOTOGRAPHY (in part)

L.A.N. Leonid Alekseyevich Nikiforov. *Former Senior Scientific Associate, Institute of History of the U.S.S.R., Academy of Sciences of the U.S.S.R., Moscow. Author of Anglo-Russian Relations in the Reign of Peter I.*

PETER I THE GREAT, OF RUSSIA (in part)

L.A.R. Lionel A. Rogg. *Professor of Organ, Counterpoint, Styles, and Form, Geneva Conservatory.*

MUSICAL FORMS AND GENRES (in part)

La.S. Lawrence Sternstein. *Senior Lecturer in Geography, Australian National University, Canberra. Former Municipal Advisor, Bangkok Municipality, Thailand. Author of Portrait of Bangkok and others.*

BANGKOK (in part)

L.A.S. Lionel Astor Sheridan. *Emeritus Professor of Law, University of Wales College of Cardiff. Coauthor of Equity.*

LAW, THE PROFESSION AND PRACTICE OF (in part)

L.A.Si. Larry A. Silver. *Professor of Art History, Northwestern University, Evanston, Illinois. Author of Art in History and others.*

FLORENCE (in part)

REMBRANDT

- L.A.St. L. Andrew Staehelin.** *Professor of Cell Biology, University of Colorado, Boulder. Coeditor of Encyclopedia of Plant Physiology* (vol. 19).
CELLS (in part)
- L.A.W. Leslie A. White** (d. 1975). *Professor of Anthropology, University of Michigan, Ann Arbor. Author of The Science of Culture: The Evolution of Culture.*
CULTURE, THE CONCEPT AND COMPONENTS OF (in part)
- L.A.Wa. Lionel A. Walford** (d. 1979). *Director, Sandy Hook Marine Laboratory, Highlands, New Jersey, 1960–71; Senior Scientist, 1971–74. Author of Living Resources of the Sea.*
FISHES (in part)
- L.B. Liliana Brisby.** *Freelance editor and writer on East European affairs. Former Editor, The World Today. Author of Les Relations russo-bulgares, 1878–1886.*
BULGARIAN LITERATURE (in part) (Micropædia)
- L.Ba. Lawrence Badash.** *Professor of the History of Science, University of California, Santa Barbara. Author of Radioactivity in America.*
BECQUEREL, HENRI (Micropædia)
- L.B.A. Leslie B. Arey** (d. 1988). *Robert L. Rea Professor and Chairman, Department of Anatomy, Medical School, Northwestern University, Chicago, 1925–56. Author of Developmental Anatomy.*
GROWTH AND DEVELOPMENT, BIOLOGICAL (in part)
- L.B.An. Linda B. Andrews.** *Assistant Professor of Psychiatry, Baylor College of Medicine, Houston, Texas.*
MENTAL DISORDERS AND THEIR TREATMENT (in part)
- L.B.As. Larned B. Asprey.** *Staff Member, Los Alamos National Laboratory, New Mexico, 1949–86. Author of numerous papers on actinide, rare-earth, transuranium, and halogen elements.*
CHEMICAL ELEMENTS (in part)
- L.Be. Lyman Benson** (d. 1993). *Emeritus Professor of Botany, Pomona College, Claremont, California, 1949–74. Author of The Cacti of the United States and Canada and others.*
ANGIOSPERMS (in part)
- L.Br. Louis Brown.** *Emeritus staff member, Department of Terrestrial Magnetism, Carnegie Institution of Washington, D.C.*
ANALYSIS AND MEASUREMENT, PHYSICAL AND CHEMICAL (in part)
- L.B.S. Leonard Bertram Schapiro** (d. 1983). *Professor of Political Science (Russian Studies), London School of Economics and Political Science, University of London, 1963–75. Author of The Communist Party of the Soviet Union and others.*
SOCIO-ECONOMIC DOCTRINES AND REFORM MOVEMENTS, MODERN (in part)
- L.B.Sm. Lyman B. Smith.** *Emeritus Botanist, Smithsonian Institution, Washington, D.C. Author of*
- Bromeliaceae—North American Flora; Flora Neotropica.*
ANGIOSPERMS (in part)
- L.C. Leonard W. Conversi.** *Former Lecturer in English, Yale University.*
LITERATURE, THE ART OF (in part)
- L.C.Br. L. Carl Brown.** *Garrett Professor Emeritus of Foreign Affairs, Princeton University. Author of The Tunisia of Ahmad Bey.*
NORTH AFRICA (in part)
- L.C.D. L.C. Dunn** (d. 1974). *Professor of Zoology, 1928–62; Senior Research Associate in Biological Sciences, 1962–74, Columbia University, New York City. Author of Heredity and Evolution in Human Populations and others.*
GROWTH AND DEVELOPMENT, BIOLOGICAL (in part)
MENDEL, GREGOR (in part) (Micropædia)
- L.C.F. Louis C. Faron.** *Emeritus Professor of Anthropology, State University of New York at Stony Brook. Author of Hawks of the Sun and others.*
AMERICAN PEOPLES, NATIVE (in part)
- L.Ch. Luciano Chiappini.** *Teacher. President, Ferrarese Delegation for the History of Italy. Committeeman, Antonio Frizzi Institute for the History of Ferrara. Author of Eleonora d'Aragona, prima duchessa di Ferrara and others.*
ESTE, HOUSE OF (Micropædia)
- L.C.H. Lois Chapman Houghton.** *Former staff member, Middle East Institute, Washington, D.C.*
DAMASCUS (in part)
- L.C.O. Leonard C. Overton.** *Country Representative, Asia Foundation, Phnom Penh, Cambodia, 1955–59, 1961–64; Saigon, South Vietnam, 1965–67.*
SOUTHEAST ASIA (in part)
- L.C.P. Linus C. Pauling** (d. 1994). *Research Professor, Linus Pauling Institute of Science and Medicine, Palo Alto, California, 1973–94. Professor of Chemistry, Stanford University, California, 1969–74. Nobel Prize for Chemistry, 1954; Nobel Prize for Peace, 1962. Author of The Nature of the Chemical Bond and others.*
CHEMICAL ELEMENTS (in part)
- L.C.Sy. Leslie Clifford Sykes.** *Former Professor of French, University of Leicester, England.*
LA FONTAINE, JEAN DE (in part) (Micropædia)
- L.D.A. Larry D. Agenbroad.** *Professor of Geology; Director, Quaternary Studies Program, Northern Arizona University, Flagstaff. Author of The Hudson-Meng Site: An Alberta Bison Kill in the Nebraska High Plains.*
GEOCHRONOLOGY (in part)
- L.De. Ludwig Denecke.** *Director, Murhard Library of the City of Kassel and State Library, and Head of the Brothers Grimm Museum, Kassel, West Germany, 1959–68. Author of Jacob Grimm und sein Bruder Wilhelm; editor of Brüder Grimm Gedenken.*
GRIMM, JACOB LUDWIG CARL AND WILHELM CARL (Micropædia)
- L. de R. Leendert de Ruiter.** *Former Professor of Comparative Animal Physiology, State University of Groningen, The Netherlands.*
BEHAVIOUR, ANIMAL (in part)
- L. de S.R. Luís de Sousa Rebelo.** *Emeritus Reader in Portuguese Studies; Calouste Gulbenkian Senior Fellow, King's College, University of London. Author of A tradição clássica na Literatura portuguesa and others.*
LISBON (in part)
PORTUGUESE LITERATURE (in part)
- L. De V. Louis De Vorse.** *Emeritus Professor of Geography, University of Georgia, Athens. Coauthor of A Panorama of Georgia.*
UNITED STATES OF AMERICA (in part)
- L.D.F. Larry D. Faller.** *Associate Professor, Department of Medicine, University of California, Los Angeles. Author of papers on the application of relaxation techniques to rapid biochemical processes.*
CHEMICAL REACTIONS (in part)
- L.D.Fr. Lawrence D. Freedman.** *Professor and Head, Department of War Studies, King's College, University of London. Author of The Evolution of Nuclear Strategy and others.*
WAR, THE THEORY AND CONDUCT OF (in part)
- L.Du. Louis Dupree** (d. 1989). *Anthropologist. Visiting Professor and Senior Research Associate, Islamic and Arabian Studies, Duke University, Durham, North Carolina, 1985–89. Field researcher in Afghanistan, India, Pakistan, and Bangladesh. Author of Afghanistan.*
AFGHANISTAN (in part)
ASIAN PEOPLES AND CULTURES (in part)
- L.Ed. Leon Edel.** *Henry James Professor Emeritus of English and American Letters, New York University, New York City. Citizens' Professor Emeritus of English Literature, University of Hawaii at Manoa. Author of The Life of Henry James and others; editor of The Complete Tales of Henry James and others.*
JAMES, HENRY (in part) (Micropædia)
- L.-E.H. Louis-Edmond Hamelin.** *Geographer, University of Quebec at Trois-Rivières; Rector, 1978–83. Author of Canada.*
NORTH AMERICA (in part)
- L.E.Hu. Lawrence E. Hussman.** *Professor of English, Wright State University, Dayton, Ohio. Author of Dreiser and His Fiction: A Twentieth-Century Quest.*
DREISER, THEODORE (Micropædia)
- L.El. Lajos Elekes.** *Former Professor of the Medieval History of Hungary, Eötvös Loránd University, Budapest. Author of Hunyadi; Mátyás és kora.*
HUNYADI, JÁNOS (Micropædia)
MATTHIAS I (HUNGARY) (Micropædia)
- Le.M. Leonard Mosley** (d. 1992). *Author of Curzon: The End of an Epoch.*
CURZON, GEORGE NATHANIEL CURZON, MARQUESS (Micropædia)

L.E.M. Leonard E. Mason. *Consultant in Pacific Islands affairs. Emeritus Professor of Anthropology, University of Hawaii at Manoa, Honolulu. Author of Relocation of the Bikini Marshallese.*

PACIFIC ISLANDS (in part)

L.E.R. Leo E. Rose. *Emeritus Professor of Political Science, University of California, Berkeley. Author of Nepal: Strategy for Survival and others.*

NEPAL (in part)

Le.S. Lee Strasberg (d. 1982). *Artistic Director, Actors Studio, 1948–82. Head, Lee Strasberg Theatre Institute, New York City. Author of Strasberg at the Actors Studio.*

THEATRE, THE ART OF THE (in part)

L.E.S. Lawrence E. Sullivan. *Professor of the History of Religions; Director, Center for the Study of World Religions, Harvard University. Author of Icanchu's Drum: South American Religions, an Orientation to Meaning.*

CHRISTIANITY (in part)

L.E.Si. Leighton E. Sissom. *Consulting engineer. Dean Emeritus, College of Engineering, Tennessee Technological University, Cookeville. Coauthor of Elements of Transport Phenomena and others.*

ENERGY CONVERSION (in part)

L.F. Linwood Fredericksen. *Manager, Planning and Research, Rotary International, Evanston, Illinois. Associate Editor, Religion, Encyclopædia Britannica, Chicago, 1969–73. Author of A Christian Witness in a Non-Christian Culture According to Clement of Alexandria.*

BIBLICAL LITERATURE AND ITS CRITICAL INTERPRETATION (in part)

CHRISTIANITY (in part)

CLEMENT OF ALEXANDRIA, SAINT (in part) (Micropædia)

DOCTRINES AND DOGMAS, RELIGIOUS (in part)

rites and CEREMONIES, SACRED (in part)

L.F. de B. Lieven Ferdinand de Beaufort (d. 1968). *Professor of Zoogeography, University of Amsterdam, 1929–49. Director, Zoological Museum, Amsterdam, 1922–49. Author of Zoogeography of the Land and Inland Waters.*

ASIA (in part)

L.F.K.W. Lothar F.K. Wickert (d. 1989). *Professor of Ancient History, University of Cologne, West Germany. Author of Theodor Mommsen: Eine Biographie; Drei Vorträge über Theodor Mommsen.*

MOMMSEN, THEODOR (Micropædia)

L.Fo. Lukas Foss. *Composer, conductor, and pianist. Music Director, 1971–90, and Conductor Laureate, Brooklyn (New York) Philharmonic. Music Director, 1981–86, Milwaukee Symphony Orchestra. Composer of Time Cycle and many other works.*

MUSIC, THE ART OF (in part)

L.F.R.W. Laurence Frederic Rushbrook Williams (d. 1978). *Editorial Adviser, The Pakistan Society, London. Vice President, Indo-British Historical Association. Editorial Staff member, The Times*

(London), 1944–55. *Author of The State of Pakistan and others.*

PAKISTAN (in part)

L.G.D. Lawrence G. Duggan. *Professor of History, University of Delaware, Newark. Author of Bishop and Chapter: The Governance of the Bishopric of Speyer to 1552.*

GERMANY (in part)

L.G.J.B. Ludwig G.J. Bieler (d. 1981). *Professor of Paleography and Late Latin, University College, Dublin, National University of Ireland. Author of Boethii Philosophiae Consolatio and others.*

IGNATIUS OF ANTIOCH, SAINT (Micropædia)

L.Go. Ludwig Goldscheider. *Art historian. Former director and designer of books for Phaidon Press Ltd., London. Author of Kokoschka; Michelangelo; and numerous other classic works on the art of antiquity, the Italian Renaissance, the Baroque, and the late 19th and early 20th centuries.*

KOKOSCHKA, OSKAR (in part) (Micropædia)

L.G.P. Leslie Gilbert Pine (d. 1987). *Writer and lecturer. Editor, Burke's Peerage. Author of The Story of Heraldry and many others.*

HERALDRY

HISTORY, THE STUDY OF (in part)

L.G.S. Lloyd Grenfell Stevenson, M.D. (deceased). *William H. Welch Professor of the History of Medicine; Director, Institute of the History of Medicine, Johns Hopkins University, Baltimore, Maryland, 1968–83.*

KOCH, ROBERT (Micropædia)

L.G.W. Leroy G. Wade, Jr. *Professor of Chemistry, Whitman College, Walla Walla, Washington. Author of Organic Chemistry and others.*

CHEMICAL COMPOUNDS (in part)

L.H. Leslie Harris. *President Emeritus, Memorial University of Newfoundland, St. John's. Author of A Short History of Newfoundland and Labrador.*

CANADA (in part)

L.H.A. Lawrence Hugh Aller. *Emeritus Professor of Astronomy, University of California, Los Angeles. Author of Atoms, Stars, and Nebulae.*

STARS AND STAR CLUSTERS (in part)

L.H.B. Leslie Hilton Brown (d. 1980). *Ornithologist, naturalist, and consultant on range management, land use, and planning. Specialist on the ecology of birds and mammals of East Africa. Author of Africa: A Natural History; African Birds of Prey; Eagles; coauthor of Eagles, Hawks and Falcons of the World.*

AFRICA (in part)

BIRDS (in part)

L.H.Bu. Lyman H. Butterfield (d. 1982). *Editor in Chief, The Adams Papers, Massachusetts Historical Society, Boston, 1954–75. Editor of Letters of Benjamin Rush.*

RUSH, BENJAMIN (Micropædia)

L.H.E. Luther Harris Evans (d. 1981). *Director, International Collections, Columbia University, 1962–71. Director General, UNESCO, 1953–58. Librarian of*

Congress, 1945–53. Author of The Virgin Islands from Naval Base to New Deal. WEST INDIES, THE (in part)

L.H.F. Louis H. Feldman. *Professor of Classics, Yeshiva University, New York City. Author of Jew and Gentile in the Ancient World and others.*

JUDAISM (in part)

L.H.H. Ludwig Heinrich Heydenreich (d. 1978). *Director, Central Institute for the History of Art, Munich, West Germany, 1947–70. Author of Leonardo da Vinci; Leonardo architetto.*

LEONARDO DA VINCI (in part)

L.Hi. Lejaren Hiller (d. 1994). *Composer. Birge-Cary Professor of Composition, State University of New York at Buffalo, 1981–89. Author of Informationstheorie und Computermusik; coauthor of Experimental Music.*

MUSICAL FORMS AND GENRES (in part)

L.H.S. Lou Hackett Silberman. *Hillel Professor Emeritus of Jewish Literature and Thought, Vanderbilt University, Nashville, Tennessee. Author of Listening to the Text; editor of Rabbinic Essays.*

JUDAISM (in part)

L.H.So. Lee H. Solomon. *President, Solomon Associates, Inc. (management consultants for petroleum refining), Dallas, Texas.*

INDUSTRIES, EXTRACTION AND PROCESSING (in part)

L.H.St. Lawrence H. Starkey. *Lecturer in Philosophy, University of Missouri, Rolla, 1986–87. Associate Editor, Philosophy, Encyclopædia Britannica, Chicago, 1968–72.*

PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (in part)

Li.L. Libero Lenti (d. 1993). *Professor of Statistics, University of Milan, 1966–81. Author of L'economia degli anni Ottanta and others.*

ITALY (in part)

L.J. Lucien Jerphagnon. *Emeritus Professor of Philosophy, University of Caen, France. Author of Le Caractère de Pascal.*

PASCAL (in part)

L.J.A. Leonard James Arrington. *Lemuel H. Redd Professor Emeritus of Western American History, Brigham Young University, Provo, Utah. Author of Great Basin Kingdom: An Economic History of the Latter-day Saints and others.*

UNITED STATES OF AMERICA (in part)

L.J.B. Louis J. Battan (d. 1986). *Professor of Atmospheric Sciences, University of Arizona, Tucson, 1958–86. World authority on radar meteorology and its applications. Author of Radar Meteorology; The Nature of Violent Storms; and others.*

CLIMATE AND WEATHER (in part)

L.J.C. Lawrence James Chisholm. *Metric consultant. Former Special Assistant, Bureau of Product Safety, Food and Drug Administration, U.S. Department of Health, Education, and Welfare, Washington, D.C. Author of Units of Weight and Measure.*

MEASUREMENT SYSTEMS (in part)

- L.J.Co.** Linda J. Colley. Richard M. Colgate Professor of History, Yale University. Author of *In Defiance of Oligarchy: The Tory Party, 1714-60*. UNITED KINGDOM (in part)
- L.J.D.** Larry James Doyle. Professor of Marine Science, University of South Florida at St. Petersburg. Coeditor of *Continental Slopes and contributor to many publications on marine science*. OCEANS (in part)
- L.J.McQ.** Lawrence J. McQuillan. Research Fellow and Economist, Hoover Institution, Stanford University, California. Coeditor of *The International Monetary Fund: Financial Medic to the World*. INTERNATIONAL MONETARY FUND (Micropædia)
- L.J.S.** Lewis Judson Stannard, Jr. (d. 1988). Taxonomist, *Illinois Natural History Survey*, Urbana, 1961-77. Author of *The Phylogeny and Classification of the North American Genera of the Suborder Tubulifera (Thysanoptera)*. INSECTS (in part)
- L.J.T.** L.J. Trinterud (deceased). Professor of Church History, San Francisco Theological Seminary, San Anselmo, California. Editor of *Elizabethan Puritanism*. BUCER, MARTIN (Micropædia)
- L.J.W.** Louis Jolyon West, M.D. Professor of Psychiatry, University of California, Los Angeles; former Director, Neuropsychiatric Institute; former Psychiatrist in Chief, UCLA Hospital and Clinics. Author of *Hallucinations*. PERCEPTION, HUMAN (in part)
- I.K.** Lawrence Kaplan. Professor of Biology, University of Massachusetts at Boston. GROWTH AND DEVELOPMENT, BIOLOGICAL (in part)
- L.K.L.** Lawrence K. Lustig. Former Vice President and Editor in Chief, *Arefé Publishing Company*, Princeton, New Jersey. Senior Editor, *Earth Sciences*, *Encyclopædia Britannica*, Chicago, 1968-73; Managing Editor, *Yearbooks*, 1974-77. An authority on *fluvial processes in arid regions*. RIVERS (in part)
- L.K.M.** Liliya Konstantinovna Malik. Senior Scientist, Institute of Geography, Russian Academy of Sciences, Moscow. Author of *The Characteristic of the Snow Cover as One of the Factors of the Formation of High Waters in the Basin of the Ob River*. ASIA (in part)
- L.Ko.** Lionel Kochan. Bearsted Reader in Jewish History, University of Warwick, England. Author of *Russia in Revolution, 1890-1918 and others*. WITTE, SERGEY YULYEVICH, GRAF (Micropædia)
- L.Kr.** Lawrence Krader. Emeritus Director, Ethnological Institute, Free University of Berlin. Author of *Peoples of Central Asia: Social Organization of Mongol-Turkic Pastoral Nomads*. ASIAN PEOPLES AND CULTURES (in part)
- I.I.H.** Laurita L. Hill (deceased). Writer and editor. Instructor in History, University of Texas at Austin, 1963-68. Coauthor of *Raymond IV, Count of Toulouse and others*. ROHEMOND I (in part) (Micropædia)
- I.I.S.** Lester I. Short. Lamont Curator of Birds, Department of Ornithology, American Museum of Natural History, New York City. BIRDS (in part)
- I.M.** Luis Michelena (d. 1987). Professor of Indo-European and Basque Linguistics, University of the Basque Country, Vitoria, Spain. Author of *Fonética histórica vasca*; editor of *Textos arcaicos vascos*. LANGUAGES OF THE WORLD (in part)
- I.Ma.** Leopold Marquard (deceased). Publisher. President, South African Institute of Race Relations, 1957-58, 1968. Author of *The Story of South Africa and others*. SMUTS, JAN CHRISTIAN (Micropædia)
- I.M.A.** Lewis M. Alexander. Emeritus Professor of Geography, University of Rhode Island, Kingston. Author of *Offshore Geography of Northwestern Europe and others*. ATLANTIC OCEAN, THE (in part)
- I.M.At.** Lewis Malcolm Atherden (d. 1973). Lecturer in Pharmaceutical Chemistry, University of Bath, England. Editor of *Bentley and Driver's Textbook of Pharmaceutical Chemistry*. INDUSTRIES, CHEMICAL PROCESS (in part)
- I.M.B.** Laurie M. Brown. Emeritus Professor of Physics and Astronomy, Northwestern University, Evanston, Illinois. Coeditor of *The Birth of Particle Physics*. PHYSICAL SCIENCES, THE (in part)
- I.M.E.** Lorraine M. Elliot. Fellow, Department of International Relations, Australian National University, Canberra. Author of *Global Environmental Governance: A Report Card for the United Nations: The Global Politics of the Environment*. ECOTERRORISM (Micropædia)
- I.M.F.** Luch Mikhaylovich Fomin. Leading Scientist, Laboratory of Synoptic-scale Processes, P.P. Shirshov Institute of Oceanology, Russian Academy of Sciences, Moscow. ATLANTIC OCEAN, THE (in part)
- I.M.K.** Lewis M. Killian. Faculty Associate, University of West Florida, Pensacola. Emeritus Professor of Sociology, University of Massachusetts at Amherst. Author of *The Impossible Revolution*; coauthor of *Collective Behavior*. COLLECTIVE BEHAVIOUR (in part)
- I.M.L.** Ludwig M. Landgrebe (deceased). Professor of Philosophy, University of Cologne. Director of the *Husserl Archives*, Cologne. Author of *Phänomenologie und Geschichte*. HUSSERL, EDMUND (Micropædia)
- I.M.M.** Leonard M. Marcus. Editor in Chief, *High Fidelity magazine and Musical America*, 1968-80. MUSIC, THE ART OF (in part)
- L.M.Ö.** The Rev. Ladislav M. Örsy, S.J. Professor of Canon Law, Catholic University of America, Washington, D.C. Author of *Marriage in Canon Law and others*. CHRISTIANITY (in part)
- L.M.-P.** Lorenzo Minio-Paluello (d. 1986). Reader in Mediaeval Philosophy, University of Oxford, 1956-75. Director of *Aristoteles Latinitas*, 1959-72. Editor of numerous works of Aristotle. ARISTOTELIANISM, ARISTOTLE AND (in part)
- L.Ms.** Luciano Martins. Assistant Professor, Federal University of Rio de Janeiro. Research Assistant, National Centre of Scientific Research, Paris. Author of *Industrialização, Burguesia Nacional e Desenvolvimento*. BRAZIL (in part)
- L.M.T.** Leonard Monteath Thompson. Charles H. Stillé Professor Emeritus of History, Yale University; Director, Yale Southern African Research Program, 1977-94. Author of *The Political Mythology of Apartheid*. SOUTHERN AFRICA (in part)
- L.M.V.V.** Leigh M. Van Valen. Professor of Ecology and Evolution, University of Chicago. ANIMALS (in part)
- L.M.W.** Lillian M. Weber. Chief Horticulture Assistant to the Senior Horticulture Specialist, New York Botanical Garden, Bronx. Collaborating Editor of *New Illustrated Encyclopedia of Gardening*. TREES (in part)
- L.N.F.** Lee Nathan Feigon. Associate Professor of History; Director, East Asian Studies, Colby College, Waterville, Maine. Staff Writer, *East Asian Affairs*, *Encyclopædia Britannica*, Chicago, 1970-73. HUNG HSIU-CH'UAN (Micropædia)
- L.O.H.** Lauri O. Honko. Professor of Folkloristics and Comparative Religion, University of Turku, Finland. Author of *Geisterglaube in Ingermanland*. EUROPEAN RELIGIONS, ANCIENT (in part)
- Lo.J.B.** Lowell John Bean. Emeritus Professor of Anthropology, California State University, Hayward. Author of *Temalpah: An Ethnobotany of the Cahuilla Indians of Southern California*; *Mukat's People: An Ecological Study of the Cahuilla Indians of Southern California*; and others. AMERICAN PEOPLES, NATIVE (in part)
- L.P.** László Péter. Professor of Hungarian History, School of Slavonic and East European Studies, University of London. BUDAPEST (in part)
- L.P.L.** Lawrence P. Lessing. Member, Board of Editors, *Fortune magazine*, New York City, 1941-52, 1965-74. Author of *Man of High Fidelity*; Edwin Howard Armstrong. ARMSTRONG, EDWIN H. (Micropædia)

L.P.Le. Lucile P. Leone. Chief Nurse Officer, Public Health Service, U.S. Department of Health, Education, and Welfare, Washington, D.C., 1949-66. Associate Dean, College of Nursing, Texas Women's University, 1968-71. Author of *Statewide Planning for Nursing Education*. MEDICINE (in part)

L.P.L.K. Leendert P. Louwe Kooijmans. Professor of Prehistory, State University of Leiden, The Netherlands. Author of *The Rhine/Meuse Delta; Verleden Land*. NETHERLANDS, THE (in part)

L.P.V. Lalita P. Vidyarthi (d. 1985). Professor and Head, Department of Anthropology, University of Ranchi, India, 1968-85. Author of *Socio-Cultural Implication of Industrialization in India and others*.

ASIAN PEOPLES AND CULTURES (in part)

L.P.W. L. Pearce Williams. John Stambaugh Professor of the History of Science; Director, Program in the History and Philosophy of Science and Technology, Cornell University, Ithaca, New York. Author of *Michael Faraday*.

FARADAY

HELMHOLTZ

SCIENCE, THE HISTORY OF (in part)

L.P.Wi. Lancelot Patrick Wilkinson (d. 1985). Brereton Reader in Classics, University of Cambridge, 1969-74; Fellow of King's College, Cambridge. Author of *Ovid Recalled and others*.

LATIN LITERATURE (in part)

L.R.C. L. Russell Cook (d. 1978). President, Chocolate and Confectionery Division, W.R. Grace & Company, New York City, 1965-73. Author of *Chocolate Production and Use*.

FOOD PROCESSING (in part)

L.R.L. Lorna R. Levi. Coauthor of *A Guide to Spiders and Their Kin*; cotranslator and coeditor of *Invertebrate Zoology* by A. Kaestner.

ARACHNIDS (in part)

L.R.R. Leonard R. Rogers. Sculptor and writer. Former Head, Faculty of Three-Dimensional Design, College of Art and Design, Loughborough, England. Author of *Sculpture: Appreciation of the Arts; Relief Sculpture*.

SCULPTURE, THE ART OF

L.R.Re. Lutz R. Reuter. Professor of Political Science, University of Armed Forces Hamburg and University of Hamburg, Germany. Coauthor of *Political Culture in West Germany*.

BERLIN (in part)

L.S. Leon Sokoloff, M.D. Emeritus Professor of Pathology, State University of New York at Stony Brook. Author of *The Biology of Degenerative Joint Disease*.

SUPPORTIVE AND CONNECTIVE TISSUES (in part)

L.S.B. Louis Stanley Berenson. Owner and Chairman of the Board, Berenson's Hartford Jai-Alai, Connecticut.

JAI ALAI (Micropædia)

L.S.E. Leigh S. Estabrook. Professor and Dean, Graduate School of Library and Information Science, University of Illinois

at Urbana-Champaign. Editor of *Libraries in a Post-Industrial Society*.

LIBRARIES (in part)

L.S.El H. Laila Shukry El Hamamsy. Director, Social Research Center, American University in Cairo.

EGYPT (in part)

L.S.F. Lewis S. Feuer. University Professor Emeritus of Sociology and Government, University of Virginia, Charlottesville. Author of *Marx and the Intellectuals and others*.

MARXISM, MARX AND (in part)

L.Si. Les Sirkin. Professor of Earth Sciences, Adelphi University, Garden City, New York. Coauthor of *Earth History and Plate Tectonics*.

GEOCHRONOLOGY (in part)

L.S.K. Lester S. King, M.D. Former Professorial Lecturer in the History of Medicine, University of Chicago. Author of *The Growth of Medical Thought*.

JENNER, EDWARD (Micropædia)

L.S.M. Lee S. Motteler. President, GeoMap Corporation, Kaneohe, Hawaii. Coauthor of *Kaneohe: A History of Change*.

UNITED STATES OF AMERICA (in part)

L.St. Leslie Anne Stainton. Independent scholar. Author of *Lorca: A Dream of Life*.

GARCIA LORCA, FEDERICO (Micropædia)

L.Sur. Leo Suryadinata. Former Research Associate, Centre for Southeast Asian Studies, Kyoto University, Japan. Author of *The Pre-World War II Peranakan Chinese Press of Java*.

GAJAH MADA (Micropædia)

KERTANAGARA (Micropædia)

L.S.V. Lalgudi Sivasubramanian Venkataramanan (deceased). Director, Institute for Social and Economic Change, Bangalore, India. Author of *The Theory of Futures Trading*.

MARKETS (in part)

L.T. Lewis Thorpe (d. 1977). Professor of French, University of Nottingham, England, 1958-77. Editor and translator of *Two Lives of Charlemagne*.

LOUIS I (GERMANY/HOLY ROMAN EMPIRE) (Micropædia)

L.T.C.R. L.T.C. Rolt (d. 1974). Member, Executive Committee, American Society for the History of Technology. Chairman, Tallylyn Railway Company, England, 1963-68. Author of *Great Engineers and many others*.

TREVITHICK, RICHARD (Micropædia)

L.Th. Laura Thompson. Consultant in applied anthropology. Field researcher on Hopi, Pagogo, Zuni, Navaho, and Sioux reservations. Author of *Culture in Crisis: A Study of the Hopi Indians and others*.

AMERICAN PEOPLES, NATIVE (in part)

L.T.N. Lennart T. Norman. Archivist and historian.

MARGARET I (DENMARK/NORWAY/ SWEDEN) (Micropædia)

SWEDEN (in part)

L.V.A. Lloyd Van Horn Armstrong (d. 1977). Chief Engineer, Diesel Engine

Department, Ingersoll Rand Company.

Coauthor of *The Diesel Engine*.

ENERGY CONVERSION (in part)

L.Ve. Louis Verniers. Honorary Secretary, General Ministry of Education, Belgium. Author of *Un millénaire d'histoire de Bruxelles, des origines à 1830 and others*. BRUSSELS (in part)

L.v.G. Ludwig von Gogolák. Author of *Csehszlovákia; "T.G. Masaryks slowakische und ungarländische Politik: Ein Beitrag zur Vorgeschichte des Zerfalls Ungarns im Jahre 1918" in Bohemia, Jahrbuch des Collegium Carolinum; and others*.

MASARYK, TOMÁŠ (Micropædia)

L.V.M. Leen Van Molle. Research Associate of the National Fund for Scientific Research, Catholic University of Louvain, Belgium. Author of *Chacun pour tous: Le Boerenbond Belge 1890-1990*.

BELGIUM (in part)

L.v.S.-P. Luitfried von Salvini-Plawen. Professor of Zoology, University of Vienna.

MOLLUSKS (in part)

L.W.B. Lewis W. Bealer. Former Assistant Professor of History, University of Oklahoma, Norman.

BRAZIL (in part)

L.W.D. Larry W. Donald. Editor and Publisher, Basketball Times.

SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

L.W.M. Larry William Moses. Professor of Central Eurasian Studies, Indiana University, Bloomington. Author of *The Politics of Mongol Buddhism and others*.

MONGOLIA (in part)

L.Wy. Sir Leonard Woolley (d. 1960). Archaeologist; excavated at Ur, 1922-34, and many other sites. Major contributor to knowledge of the Sumerians. Author of *Digging Up the Past; Excavations at Ur; and others*.

UR (in part) (Micropædia)

L.Y.B. Louay Y. Bahry. Adjunct Professor of Political Science, University of Tennessee, Knoxville. Author of *Die Bagdad-Bahn: A Study in the Development and Diplomacy of the Baghdad Railway Question*.

BAGHDAD (in part)

L.Z. Lev Zetlin (d. 1992). President, Zetlin-Argo Structural Investigations, Inc., New York City, 1983-92. Author of *structural and civil engineering handbooks on concrete and suspension structures*.

STADIUM (in part) (Micropædia)

L.Zg. Ladislav Zgusta. Professor of Linguistics and of Classics; Director, Center for Advanced Studies, University of Illinois at Urbana-Champaign. Author of *Kleinasiatische Personennamen*.

NAMES

M.A. Marcelle Auclair (d. 1983). Writer. Author of *Enfances et mort de Garcia Lorca and others*.

GARCIA LORCA, FEDERICO (Micropædia)

Ma.A. Maurice Allais. Professor of Economic Analysis, National College of Mines of Paris. Professor of Monetary

Analysis, University of Paris X, 1970–85. Nobel Prize for Economics, 1988. Author of *Traité d'économie pure.*

INTERNATIONAL TRADE (*in part*)

M.A.A. Maynard A. Amerine. *Emeritus Professor of Enology, University of California, Davis; Emeritus Enologist at the Agricultural Experiment Station. Coauthor of The Technology of Wine Making.*

BEVERAGE PRODUCTION (*in part*)

Ma.A.C. Margret A. Carey. *Former Assistant Keeper, Department of Ethnography, British Museum, London. Author of Beads and Beadwork of East and South Africa and others.*

AFRICAN ARTS (*in part*)

M.A.AL. The Rev. Michel Adrien Allard, S.J. (d. 1976). *Director, Institute of Oriental Studies, St. Joseph University, Beirut, Lebanon. Author of Le problème des attributs divins en théologie musulmane and others.*

ASH'ARI, ABU AL-HASAN AL- (*in part*)
(Micropædia)

M.A.A.-T. Michael Arthur Aung-Thwin. *Associate Professor of Asian Studies, University of Hawaii at Manoa, Honolulu. Author of Pagan: The Origins of Modern Burma and others.*

SOUTHEAST ASIA (*in part*)

Ma.B. Marino Berengo. *Professor of Modern History, University of Venice. Author of La società veneta alla fine del 700 and others.*

ITALY (*in part*)

Ma.Br. Martin Brett. *Fellow and Lecturer of Robinson College, University of Cambridge. Author of English Church under Henry I.*

EUROPEAN HISTORY AND CULTURE (*in part*)

Ma.Bu. Martin Butlin. *Former Keeper of the British Collection, Tate Gallery, London. Author of Turner Watercolours; coauthor of The Paintings of J.M.W. Turner.*

TURNER, J.M.W. (*in part*) (Micropædia)

M.A.C. Margaret A. Clarke. *Managing Director, Sugar Processing Research Institute, Inc., New Orleans, Louisiana. Editor of Carbohydrates in Industrial Synthesis.*

FOOD PROCESSING (*in part*)

M.A.Ca. Marcello A. Carmagnani. *Professor of Latin American History, University of Turin, Italy. Author of Les mécanismes de la vie économique dans une société coloniale: le Chili, 1680–1830 and others.*

CHILE (*in part*)

M.A.D. Michael Aaron Dennis. *Assistant Professor of Science and Technology Studies, Cornell University, Ithaca, New York. Author of A Change of State: The Political Cultures of Technical Practice at the MIT Instrumentation Laboratory and the Johns Hopkins University Applied Physics Laboratory, 1930–1945.*

BERNERS-LEE, TIM (Micropædia)

BROOKS, RODNEY (Micropædia)

DARPA (Micropædia)

SILICON VALLEY (Micropædia)

M.A.E. M. Albert Evans (d. 1993). *Mining consultant. Coauthor of Technical Manual on Longwall Mining Systems.*

INDUSTRIES, EXTRACTION AND PROCESSING (*in part*)

Ma.E.O. Mario E. Occhialino. *Professor of Law, University of New Mexico, Albuquerque.*

PROCEDURAL LAW (*in part*)

Ma.F. Marvin Frankel. *Emeritus Professor of Economics, University of Illinois at Urbana-Champaign. Author of British and American Manufacturing Productivity: A Comparison and Interpretation.*

ECONOMIC GROWTH AND PLANNING (*in part*)

Ma.Fu. Masutani Fumio. *Former Professor of the History of Religion, Taisho University, Tokyo.*

HÖNEN (Micropædia)

M.A.G. Mahmud Ali Ghul (deceased). *Professor of Arabic and Semitic Languages, American University of Beirut, Lebanon.*

ARABIA (*in part*)

M.A.GI. Mary Ann Glendon. *Learned Hand Professor of Law, Harvard University. Author of A Nation Under Lawyers and others.*

INHERITANCE AND SUCCESSION (*in part*)

LAW, THE PRACTICE AND PROFESSION OF (*in part*)

LEGAL SYSTEMS, THE EVOLUTION OF MODERN WESTERN (*in part*)

Ma.H. Marshall Hall, Jr. *Professor of Mathematics, Emory University, Atlanta, Georgia. IBM Professor Emeritus of Mathematics, California Institute of Technology, Pasadena. Author of The Theory of Groups; Combinatorial Theory.*

ALGEBRA (*in part*)

M.A.H. Michael Anthony Hoskin. *Fellow of Churchill College, Cambridge; former Lecturer in the History of Science, University of Cambridge. Author of William Herschel and the Construction of the Heavens.*

LOVELL, SIR BERNARD (*in part*)

(Micropædia)

Ma.Ha. Mamie Harmon. *Contributor to Dictionary of Folklore, Mythology and Legend; contributor and advisory editor to Encyclopedia of World Art.*

FOLK ARTS (*in part*)

Ma.J. Marsden Jones (d. 1992). *Professor of Arabic Studies, American University in Cairo, 1960–90. Editor of Kitāb al-maghāzī lil-Wāgīdī.*

EGYPT (*in part*)

Ma.J.M. Matthew James Moulton. *Former Chief Editorial Writer, The Scotsman, Edinburgh.*

UNITED KINGDOM (*in part*)

Ma.K. Max Kaltenmark. *Director of Studies, École Pratique des Hautes Études (Institute for Advanced Research), Paris, 1957–78. Author of Lao Tzu and Taoism.*

LAO-TZU (Micropædia)

M.A.K. Mark A. Kishlansky. *Professor of History, University of Chicago. Author of Parliamentary Selection and others.*

UNITED KINGDOM (*in part*)

Ma.Ko. Margaret Kohl. *Freelance writer and translator. Staff member, English Department, Ludwig Maximilian University of Munich, 1962–68; 1978–80.*

COLOGNE (*in part*)

M.AL. Mohammad Ali (deceased). *Professor and Head, Department of History, Kābul University, Afghanistan. Author of A Cultural History of Afghanistan; Afghanistan: Land of Glorious Past; and many other works on Afghan history, culture, and economy.*

AFGHANISTAN (*in part*)

MAHMŪD (GHAZNA) (Micropædia)

Ma.M. Maurice Matloff. *Adjunct Professor of History, Georgetown University, Washington, D.C. Chief Historian, Center of Military History, U.S. Department of the Army, Washington, D.C., 1973–81. Author of Strategic Planning for Coalition Warfare, 1943–1944; editor of American Military History.*

WAR, THE THEORY AND CONDUCT OF (*in part*)

M.A.M. Maurice Alfred Millner. *Emeritus Professor of Law, University College, University of London. Author of Negligence in Modern Law.*

LEGAL SYSTEMS, THE EVOLUTION OF MODERN WESTERN (*in part*)

M.A.MacC. Michael A. MacConaill (d. 1987). *Professor of Anatomy, University College, Cork, National University of Ireland. Coauthor of Synovial Joints; Muscles and Movements.*

SUPPORTIVE AND CONNECTIVE TISSUES (*in part*)

Ma.McC. Martin McCauley. *Senior Lecturer in Politics and Chairman, Department of Social Sciences, School of Slavonic and East European Studies, University of London. Editor of The Soviet Union Under Gorbachev and others.*

RUSSIA (*in part*)

UNION OF SOVIET SOCIALIST REPUBLICS (*in part*)

Ma.Me. Matthew Meselson. *Professor of Molecular and Cellular Biology, Harvard University. Editor of Chemical Weapons and Chemical Arms Control.*

WAR, THE TECHNOLOGY OF (*in part*)

Ma.N. Manning Nash. *Emeritus Professor of Anthropology, University of Chicago. Specialist on economic development and cultural change. Author of Machine-Age Maya.*

AMERICAN PEOPLES, NATIVE (*in part*)

Ma.P. Maurizio Parotto. *Professor of Geology, University of Rome. Coauthor and coeditor of Structural Model of Italy.*

EUROPE (*in part*)

Ma.R. Mary Rowlett (d. 1983). *Freelance writer on Egypt. Author of Founders of Modern Egypt.*

ALEXANDRIA (*in part*)

M.Ar. Michael Argyle. *Emeritus Reader in Social Psychology, University of Oxford. Author of Social Interaction.*

SOCIAL SCIENCES, THE (*in part*)

M.A.R. Margaret Ann Richardson. *Curator, Sir John Soane's Museum, London.*

PALLADIO, ANDREA (Micropædia)

M.A.Ro. Margaret Ann Rowe. *Former Lecturer in English, Palmerston North Teachers' College, New Zealand. Coauthor of New Zealand.*

NEW ZEALAND (in part)

M.As. Maurice Ashley (d. 1994). *Research Fellow, Loughborough University of Technology, England, 1967–70. Editor, The Listener, 1958–67. Author of The Greatness of Oliver Cromwell.*

CHARLES I (GREAT BRITAIN) (Micropædia)
CROMWELL, OLIVER (in part)

M.A.S. M.A. Screech. *Senior Research Fellow, All Souls College, University of Oxford. Fielden Professor of French Language and Literature, University College, University of London, 1971–84. Author of Rabelais and others.*

RABELAIS, FRANÇOIS (in part) (Micropædia)

M.A.Su. Margaret Ann Sumner. *Lecturer in Physiology, University of Melbourne, Australia, and University College, University of London. Author of Thought for Food.*

DRUGS AND DRUG ACTION (in part)

M.A.v.M. M.A. van Meerhaeghe. *Emeritus Professor of Economics, State University of Ghent, Belgium. Author of International Economics and others.*

INTERNATIONAL TRADE (in part)

M.B. Minodhar Barthakur. *Former Professor of Geography, Gauhati University, India. Author of numerous articles on geography.*

INDIA (in part)

M.Ba. Michael Bar-Zohar. *Freelance writer. Member of the Knesset. Lecturer in Political Science, Haifa University, Israel, 1970–73. Author of Ben-Gurion: The Armed Prophet and others.*

BEN-GURION, DAVID (Micropædia)

M.Be. Manfred Bensing. *Emeritus Professor of History, University of Leipzig, Germany. Author of Thomas Müntzer.*

MÜNTZER, THOMAS (Micropædia)

M.Bg. Mark Blaug. *Visiting Professor of Economics, University of Exeter, England. Emeritus Professor of Economics, University of Buckingham, England. Emeritus Professor of the Economics of Education, Institute of Education, University of London. Author of Economic Theory in Retrospect.*

SOCIAL SCIENCES, THE (in part)

M.B.G. Manuel Ballesteros Gaibrois. *Professor and Head, Section of American History, University of Madrid. Author of Francisco Pizarro and others.*

PIZARRO, FRANCISCO (in part) (Micropædia)

M.B.J. Marius B. Jansen. *Emeritus Professor of History, Princeton University. Author of Sakamoto Ryōma and the Meiji Restoration and others.*

JAPAN (in part)

M.Bl. Miroslav Blažek. *Former Professor of Human Geography and of Regional Economy, School of Economics, Prague.*

Author of Economic Geography of Czechoslovakia.

CZECH AND SLOVAK REPUBLICS (in part)

M.B.McE. Michael B. McElroy. *Abbott Lawrence Rotch Professor of Atmospheric Sciences; Chairman, Department of Earth and Planetary Sciences, Harvard University.*

ATMOSPHERE (in part)

M.Bo. Marc Bouloiseau. *Former Secretary, Commission for the Economic and Social History of the French Revolution. Emeritus Teaching Assistant in History of the French Revolution, University of Paris. Author of Robespierre.*

ROBESPIERRE, MAXIMILIEN-FRANÇOIS-
MARIE-ISIDORE DE (Micropædia)

M.B.P. Michael B. Poliakoff. *Classicist. Author of Combat Sports in the Ancient World.*

BOXING (in part)

M.Br. Michael Brett. *Senior lecturer in the history of North Africa, School of Oriental and African Studies, University of London. Author of The Moors.*

NORTH AFRICA (in part)

M.B.R. Michael B. Rowton (d. 1986). *Professor of Near Eastern Languages and Civilizations, Oriental Institute, University of Chicago.*

HISTORY, THE STUDY OF (in part)

M.B.T. Martin B. Thorp. *Senior Lecturer in Geography, University College, Dublin, National University of Ireland. Coauthor of An Advanced Geography of Africa.*

WESTERN AFRICA (in part)

M.B.Th. Michael B. Thompson. *Senior Lecturer in Biological Sciences, University of Sydney, Australia.*

BIOSPHERE AND CONCEPTS OF ECOLOGY, THE
(in part)

M.Bu. Milton Burton (d. 1985). *Professor of Chemistry, University of Notre Dame, Indiana, 1945–71; Director, Radiation Laboratory, 1946–71. Coeditor of Advances in Radiation Chemistry.*

RADIATION (in part)

M.C. Maurice Cranston (d. 1993). *Professor of Political Science, London School of Economics and Political Science, University of London, 1969–85. Biographer of Locke and Rousseau.*

GENEVA (in part)

HUME (in part)

IDEOLOGY

ROUSSEAU, JEAN-JACQUES

M.Car. Max Cary (d. 1958). *Reader, then Professor of Ancient History, University of London, 1908–46. Author of The Geographic Background of Greek and Roman History.*

GREEK AND ROMAN CIVILIZATIONS, ANCIENT
(in part)

M.C.D.-M. Margaret C. Davies-Mitchell. *Emeritus Professor of French, University of Reading, England. Author of Une saison en enfer d'Arthur Rimbaud: analyse du texte and others.*

RIMBAUD, ARTHUR (Micropædia)

McG.G. McGuire Gibson. *Professor of Mesopotamian Archaeology, University of*

Chicago. Author of The City and Area of Kish; editor of The Organization of Power; Aspects of Bureaucracy in the Ancient Near East.

ASIA (in part)

M.Ch. Mary Chamot (d. 1993). *Assistant Keeper, Tate Gallery, London, 1950–65. Author of Modern Painting in England.*

TURNER, J.M.W. (in part) (Micropædia)

M.C.K. Michael C. Kelley. *Professor of Electrical Engineering, Cornell University, Ithaca, New York. Author of The Earth's Ionosphere: Plasma Physics and Electrodynamics.*

MATTER (in part)

M.Cl. Martin Clark. *Reader in Politics, University of Edinburgh. Author of Modern Italy, 1871–1982 and others.*

ITALY (in part)

M.C.M. Michael C. Meyer. *Professor of History, University of Arizona, Tucson. Coauthor of The Course of Mexican History.*

MEXICO (in part)

M.C.Ma. Michael C. Malin. *President and Chief Scientist, Malin Space Science Systems, Inc., San Diego, California. Professor of Geology, Arizona State University, Tempe, 1987–91. Coauthor of Earthlike Planets.*

SOLAR SYSTEM, THE (in part)

M.Co. Michael Cordner. *Senior Lecturer in English and Related Literature, University of York, England. General Editor, Oxford University Press Drama Library. Editor of The Plays of Sir George Etherege.*

ENGLISH LITERATURE (in part)

M.C.P. Michael Charles Prestwich. *Professor of History, University of Durham, England. Author of The Three Edwards.*

UNITED KINGDOM (in part)

M.C.R. Marvin Chauncey Ross (d. 1977). *Curator, Hillwood (art collections of Mrs. Merriweather Post), Washington, D.C. Chief Curator, Los Angeles County Museum of Art, 1952–55.*

DECORATIVE ARTS AND FURNISHINGS
(in part)

M.C.S. Malcolm C. Shurtleff. *Professor of Plant Pathology; Extension Plant Pathologist, University of Illinois at Urbana-Champaign. Author of How to Control Plant Diseases in Home and Garden.*

DISEASE (in part)

M.Cu. Michael Cuffe, M.D. *Writer on biology.*

CELLS (in part)

M.C.U. Melvyn C. Usselman. *Associate Professor of Chemistry, University of Western Ontario, London.*

CHEMICAL COMPOUNDS (in part)

PHYSICAL SCIENCES, THE (in part)

M.D. Myles Dillon (d. 1972). *Senior Professor of Celtic Studies, Dublin Institute for Advanced Studies, 1949–72. Author of Early Irish Society.*

EUROPEAN RELIGIONS, ANCIENT (in part)

M.Da. Monique Dacharry. *Professor of Geography, University of Lille I, France. Author of Hydrologie de la Loire and others.*

EUROPE (in part)

M.D.B. Marvin David Bernstein. *Emeritus Professor of History, State University of New York at Buffalo. Author of The Mexican Mining Industry, 1890–1950.*

MEXICO (in part)

M.D.C. Michael Douglas Coe. *Emeritus Professor of Anthropology, Yale University. Author of The Maya.*

PRE-COLUMBIAN CIVILIZATIONS (in part)

M.-D.Ch. The Rev. Marie-Dominique Chenu, O.P. (d. 1990). *Lecturer, École pratique des hautes études, Paris, 1945–51. Author of Toward Understanding St. Thomas and others.*

THOMISM, THOMAS AQUINAS AND (in part)

M.D.D. Morton D. Davis. *Professor of Mathematics, City College, City University of New York. Author of Game Theory: A Nontechnical Introduction.*

GAME THEORY

M. de F. Michael de Ferdinandy. *Emeritus Professor of Humanities, University of Puerto Rico, Río Piedras. Author of El emperador Carlos V: semblanza de un hombre and others. CHARLES V (GERMANY/HOLY ROMAN EMPIRE) (in part) (Micropædia)*

M.D.H.M. Mark D.H. Miller. *Research Associate, Syracuse University, New York. SOUTH AMERICA (in part)*

M.Di. Morris Dickstein. *Director, Center for the Humanities; Professor of English, Queens College and Graduate School and University Center, City University of New York. Author of Gates of Eden: American Culture in the Sixties and others.*

AMERICAN LITERATURE (in part)

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BECKET, SAINT THOMAS (Micropædia)

BENEDICT OF NURSIA, SAINT (Micropædia)

HENRY II (ENGLAND) (Micropædia)

MACAULAY, THOMAS BABINGTON MACAULAY, BARON (Micropædia)

ROMAN CATHOLICISM (in part)

M.Do. Martin Domke (d. 1980). *Adjunct Professor of Law, New York University, New York City. Consultant on commercial and international arbitration. Author of The Law and Practice of Commercial Arbitration.*

JUDICIAL AND ARBITRATIONAL SYSTEMS (in part)

M.Dr. Moira Dunbar. *Staff member, Division of Earth Sciences, Defence Research Board, Ottawa, Ontario, 1947–78; Acting Director, 1975–77. ARCTIC, THE (in part)*

M.D.R. Milton D. Rafferty. *Professor and Head, Department of Geography, Geology, and Planning, Southwest*

Missouri State University, Springfield. Author of Missouri: A Geography.

UNITED STATES OF AMERICA (in part)

M.Du. Maurice Duverger. *Emeritus Professor of Political Science, University of Paris I. Member, European Parliament. Author of Les Partis politiques.*

POLITICAL PARTIES AND INTEREST GROUPS (in part)

M. Du P.C. Martin Du Pré Cooper (d. 1986). *Music Editor, Daily Telegraph, London, 1954–76. Author of Georges Bizet and others.*

BIZET, GEORGES (Micropædia)

FRANCK, CÉSAR (Micropædia)

M.E. Marcel Emerit (d. 1985). *Professor of History, University of Lille, France, 1964–69. Author of L'Algérie à l'époque d'Abd-el-Kader.*

ABDELKADER (Micropædia)

M.E.Bl. Milton E. Bliss. *Farmer and agricultural communications specialist. Author of A Handbook on Farm Broadcasting for the Developing Countries. FARMING AND AGRICULTURAL TECHNOLOGY (in part)*

M.Ec. Myron Echenberg. *Associate Professor of History, McGill University, Montreal.*

WESTERN AFRICA (in part)

M.E.D. M. Edward Davis, M.D. (d. 1978). *Joseph Bolivar De Lee Professor of Obstetrics and Gynecology, University of Chicago, 1947–66. Coauthor of De Lee's Obstetrics for Nurses.*

REPRODUCTION AND REPRODUCTIVE SYSTEMS (in part)

M.E.DeB. Michael E. DeBakey, M.D. *Chancellor, Baylor College of Medicine; Distinguished Service Professor of Surgery. Director, DeBakey Heart Center, Methodist Hospital, Houston, Texas. Coauthor of Blood Transfusion and others.*

CIRCULATION AND CIRCULATORY SYSTEMS (in part)

M.e.D.S. Mohy el Din Sabr. *Former Director General, Arab League Educational, Cultural and Scientific Organization, Cairo. Minister of Education, Republic of The Sudan, 1969–72. Author of Cultural Change and Community Development.*

SUDAN, THE (in part)

M.E.Du. Manuel E. Duran. *Professor of Hispanic Literature, Yale University. Coauthor of Earth Tones: The Poetry of Pablo Neruda.*

NERUDA, PABLO (Micropædia)

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SACRED OFFICES AND ORDERS (in part)

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of Venezuela, Caracas. Author of The Orinoco Basin.

SOUTH AMERICA (in part)

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UNITED STATES OF AMERICA (in part)

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WAR, THE THEORY AND CONDUCT OF (in part)

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FREUD

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PROTESTANTISM (in part)

ROMAN CATHOLICISM (in part)

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HERZEN, ALEKSANDR (Micropædia)

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SOUTHEAST ASIA (in part)

M.E.P. Maynard E. Pirsig (d. 1997). *Professor of Law, University of Minnesota, Minneapolis, 1993–70; Dean, Law School, 1948–55. Coauthor of Cases and Materials on Professional Responsibility.*

LAW, THE PROFESSION AND PRACTICE OF (in part)

M.E.R. Marjorie E. Reeves. *Honorary Fellow and former Vice-Principal, St. Anne's College, Oxford; former Lecturer in Modern History, University of Oxford. Author of The Influence of Prophecy in the Later Middle Ages: A Study in Joachimism and others.*

JOACHIM OF FIORE (Micropædia)

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CIRCULATION AND CIRCULATORY SYSTEMS (in part)

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TURKEY AND ANCIENT ANATOLIA (in part)

M.F.A. Sir Michael Francis Atiyah. *Master, Trinity College, University of Cambridge. Royal Society Research Professor, Mathematical Institute, University of Oxford, 1973–90. Author of K-Theory; coauthor of Introduction to Commutative Algebra.*
TOPOLOGY (in part)

M.F.Go. Morris F. Goodman. *Associate Professor Emeritus of Linguistics, Northwestern University, Evanston, Illinois. Author of several articles on African languages and A Comparative Study of Creole French Dialects.*
LANGUAGES OF THE WORLD (in part)

M.F.K. Melanie F. Knights. *Graduate student in geography, University of Sussex, Brighton, England.*
ITALY (in part)

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VESALIUS, ANDREAS (in part) (Micropædia)

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LANGUAGES OF THE WORLD (in part)

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CIRCULATION AND CIRCULATORY SYSTEMS (in part)

M.Fr. Milton Friedman. *Paul Snowden Russell Distinguished Service Professor Emeritus of Economics, University of Chicago. Senior Research Fellow, Hoover Institution, Stanford University, California. Nobel Prize for Economics, 1976. Author of Price Theory and others.*
MONEY

M.Fre. Michael Freund (d. 1973). *Professor of Political Theory and History, Christian Albrecht University of Kiel, West Germany. Author of "Friedrich Ebert" in Die grossen Deutschen and others.*
EBERT, FRIEDRICH (Micropædia)

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Compulsivity Programs, St. Louis, Missouri.

SEX AND SEXUALITY (in part)

M.G. Marija Gimbutas (d. 1994). *Professor of European Archaeology and Indo-European Studies, University of California, Los Angeles, 1963–89. Author of The Bronze Age Cultures of Central and Eastern Europe and others.*
BALTIC STATES (in part)
PREHISTORIC PEOPLES AND CULTURES (in part)

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JOAN OF ARC (in part)

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WILLIAM II (GERMAN EMPIRE) (Micropædia)

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CRUSADES (in part)

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DORGON (Micropædia)

M.G.L. Maxwell Gordon Lay. *Director, Quality and Technical Resources, Vic Roads (engineering consultants), Bulleen, Australia. Professorial Associate, University of Melbourne, Australia. Author of Handbook of Road Technology (2 vol.) and others.*
PUBLIC WORKS (in part)

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BARBIE (Micropædia)

M.Gr. Michael Grant. *President and Vice-Chancellor, Queen's University of Belfast, Northern Ireland, 1959–66. Author of History of Rome and others; editor of Latin Literature and others.*
ANTONY, MARK (Micropædia)
AUGUSTUS
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HORACE (Micropædia)

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AFGHANISTAN (in part)

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M.H. Maureen Heneghan Tripp. *Costume Designer, Stratford-on-Avon Shakespeare Company, BBC-TV, and Stratford Festival, Ontario. Associate*

Professor of Costume Design, Brandeis University, Waltham, Massachusetts.

THEATRICAL PRODUCTION (in part)

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TRAJAN (Micropædia)

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URUGUAY (in part)

M.Has. Margaret Hastings (d. 1979). *Professor of History, Douglass College, Rutgers University, New Jersey, 1960–75. Author of The Court of Common Pleas in Fifteenth Century England and others.*
UNITED KINGDOM (in part)

M.H.Au. Maung Htin Aung (d. 1978). *Associate Fellow, St. Antony's College, University of Oxford. Burmese Ambassador to Ceylon, 1959–63. Rector and Vice-Chancellor, University of Rangoon, 1946–59. Author of Burmese Drama; A History of Burma; and others.*
SOUTHEAST ASIA (in part)
SOUTHEAST ASIAN ARTS (in part)

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LAWRENCE, D.H. (Micropædia)

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BEHAVIOUR, THE DEVELOPMENT OF HUMAN (in part)

M.H.C. Mary Heimerdinger Clench. *Research Scientist, Department of Internal Medicine, University of Texas Medical Branch at Galveston. Research Associate, Carnegie Museum of Natural History, Pittsburgh. Author and coauthor of numerous articles on birds.*
BIRDS (in part)

M.H.Ca. Michael H. Carr. *Research Geologist, U.S. Geological Survey, Menlo Park, California. Leader of Viking orbiter imaging team; team member on Voyager, Galileo, and numerous Mars missions. Author of The Surface of Mars; Water on Mars.*
SOLAR SYSTEM, THE (in part)

M.H.D. Michael H. Day. *Staff member, Department of Palaeontology, Natural History Museum, London. Emeritus Professor of Anatomy, United Medical and Dental Schools of Guy's and St. Thomas's Hospitals, University of London. Author of Guide to Fossil Man.*
EVOLUTION, HUMAN (in part)

M.H.K. Malcolm H. Kerr (d. 1984). *President, American University of Beirut, Lebanon, 1982–84. Professor of Political Science, University of California, Los Angeles, 1967–82. Author of Islamic Reform: The Political and Legal Theories of Muhammad 'Abduh and Rashid Rida.* 'ABDUH, MUHAMMAD (Micropædia)

M.Hl. Martin Hall. *Professor of Archaeology, University of Cape Town. Author of Farmers, Kings, and Traders: The People of Southern Africa, 200–1860.* SOUTHERN AFRICA (in part)

M.H.S. The Rev. Massey H. Shepherd, Jr. *Hodges Professor Emeritus of Liturgics, Church Divinity School of the Pacific, Berkeley, California. Author of The Worship of the Church and others.* CHRISTIANITY (in part)

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M.H.W. Michael Henry Woodford. *Secretary, British Falconers' Club, London, 1956–67. Author of A Manual of Falconry.* FALCONRY (in part) (Micropædia)

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M.H.Z. Martin Huldrych Zimmermann (d. 1984). *Charles Bullard Professor of Forestry, Harvard University; Director, Harvard Forest, Petersham, 1970–84. Coauthor of Trees: Structure and Function.* ANGIOSPERMS (in part)

M.I. Massimo Introvigne. *Managing Director, Center for Studies on New Religions (CESNUR), Turin, Italy. Author of Le Nuove Religioni; Enquête sur le Satanisme.* FALUN GONG (Micropædia)

M.I.A.L. Michael I.A. Linton. *Assistant Professor of History, University of Aarhus, Denmark.* DENMARK (in part)

Mi.Be. Michael Berenbaum. *Director, United States Holocaust Research Institute of the U.S. Holocaust Memorial Museum, 1993–97. Author of The World Must Know: The History of the Holocaust; After Tragedy and Triumph; and others.* ANTI-SEMITISM (Micropædia)
HOLOCAUST
HOLOCAUST REMEMBRANCE DAYS (Micropædia)

M.I.C. Dame Margaret I. Cole (d. 1980). *Honorary President, Fabian Society, England. Author of Beatrice Webb and others; editor of The Webbs and Their Work.* WEBB, SIDNEY AND BEATRICE (Micropædia)

Mi.Ch. Michel Chossudovsky. *Professor of Economics, University of Ottawa, Ontario. Author of The Globalisation of Poverty: Impacts of IMF and World Bank Reforms and others.* INTERNATIONAL BANK FOR RECONSTRUCTION AND DEVELOPMENT (Micropædia)

Mi.D. Michael A.E. Dummett. *Wykeham Professor Emeritus of Logic, University of Oxford; Emeritus Fellow of New College and of All Souls College, Oxford. Author of Frege: Philosophy of Language and others.* FREGE, GOTTLÖB (Micropædia)

M.I.H. Marvin Irving Herzog. *Atrani Professor Emeritus of Linguistics and Yiddish Studies, Columbia University. Director and Editor in Chief, Language and Culture Atlas of Ashkenazic Jewry. Author of The Yiddish Language in Northern Poland; coeditor of The Field of Yiddish, Third and Fourth Collections.* LANGUAGES OF THE WORLD (in part)

Mi.Ha. Milan Hauner. *Honorary Fellow, History Department, University of Wisconsin, Madison. Author of India in Axis Strategy.* CZECH AND SLOVAK REPUBLICS (in part)

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Mi.L. Michael Levi. *Professor of Criminology, University of Wales College of Cardiff. Author of Regulating Fraud: White-collar Crime and the Criminal Process and others.* CRIME AND PUNISHMENT (in part)

Mi.M. Michael Millgate. *University Professor Emeritus of English, University of Toronto. Author of The Achievement of William Faulkner; Thomas Hardy: A Biography.* FAULKNER, WILLIAM (CUTHBERT) (Micropædia)
HARDY, THOMAS (Micropædia)

Mi.Ma. Michael Edward Mallett. *Professor of History, University of Warwick, England. Author of The Borgias and others.* BORGIA, CESARE, DUC DE VALENTINOIS (Micropædia)

M.I.R. Mikhail Ivanovich Rostovtsev. *Former Senior Research Associate, Institute of Geography, Academy of Sciences of the U.S.S.R., Moscow. Coauthor of Belorussian S.S.R.* BELARUS (in part)

Mi.Ro. Michel Rouzé. *Former producer in French broadcasting. Author of Robert Oppenheimer and the Atomic Bomb; Robert Oppenheimer: The Man and His Theories.* OPPENHEIMER, J. ROBERT (Micropædia)

M.I.S. Merrill I. Skolnik. *Superintendent, Radar Division, Naval Research Laboratory, Office of Naval Research, U.S. Department of the Navy, Washington, D.C. Author of Introduction to Radar Systems; editor of Radar Handbook.* RADAR

Mi.T. Michael Talbot. *Professor of Music, University of Liverpool, England. Author of Vivaldi.* VIVALDI, ANTONIO (Micropædia)

Mi.V. Michele Vishny. *Art historian and critic. Author of Mordcai Ardon; contributor to Arts Magazine.* PISSARRO, CAMILLE (Micropædia)

M.I.V. Milton I. Vanger. *Emeritus Professor of History, Brandeis University, Waltham, Massachusetts; Chairman of Latin-American Studies, 1971–81. Author of José Batlle y Ordoñez of Uruguay (2 vol.).* URUGUAY (in part)

M.I.W. Matthew Immanuel Wiencke. *Emeritus Professor of Classics, Dartmouth College, Hanover, New Hampshire.* WINCKELMANN, JOHANN (Micropædia)

M.I.Wr. Marion I. Wright. *Emerita Professor of Geography, Rhode Island College, Providence. Author of Providence: A Metropolitan Region.* UNITED STATES OF AMERICA (in part)

M.J. Madeleine Jarry (d. 1982). *Principal Inspector, Mobilier National (state furniture collection); National Factories of Gobelins and Beauvais (tapestry); and of the Savonnerie (carpet factory), Ministry of Cultural Affairs, France. Author of World Tapestry.* DECORATIVE ARTS AND FURNISHINGS (in part)

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M.J.Dr. Mark J. Dresden (d. 1986). *Professor of Iranian Studies, University of Pennsylvania, Philadelphia, 1960–80. Editor of Modern Persian Reader.* IRAN (in part)

M.J.Du. Maxwell John Dunbar. *Emeritus Professor of Oceanography, McGill University, Montreal; Chairman, Marine Sciences Center, 1963–77. Author of Ecological Development in Polar Regions.* ARCTIC, THE (in part)

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CIRCULATION AND CIRCULATORY SYSTEMS
(in part).

M.J.Ga. **Matthew J. Gabel.** *Professor of Political Science, University of Kentucky, Lexington. Author of Interests and Integration: Market Liberalization, Public Opinion, and the European Union; associate editor of European Union Politics.*

EUROPEAN COMMUNITY (Micropædia)
EUROPEAN UNION (Micropædia)

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BOHR (in part)

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ARCHITECTURE, THE HISTORY OF WESTERN
(in part)

PAINTING, THE HISTORY OF WESTERN
(in part)

SCULPTURE, THE HISTORY OF WESTERN
(in part)

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BIOSPHERE AND CONCEPTS OF ECOLOGY, THE
(in part)

M.J.L. **Margaret Jean Legum.** *Training consultant on race and gender equality. Coauthor of South Africa: Crisis for the West.*

SOUTHERN AFRICA (in part)

M.J.LaM. **Matthew J. LaMourie.** *Researcher, Marine Policy Center, Woods Hole Oceanographic Institution, Massachusetts.*

ATLANTIC OCEAN, THE (in part)

M.J.Lo. **M. John Loeffler.** *Emeritus Professor of Geography, University of Colorado, Boulder. Author of several articles on Colorado.*

NORTH AMERICA (in part)

UNITED STATES OF AMERICA (in part)

M.J.MacL. **Murdo J. MacLeod.** *Graduate Research Professor of History, University of Florida, Gainesville. Author of Spanish Central America.*

ECUADOR (in part)

WEST INDIES, THE (in part)

M.J.Mo. **Michel J. Mollat.** *Emeritus Professor of History, University of Paris. Author of Genèse médiévale de la France moderne; Les Affaires de Jacques Coeur; and others.*

CHARLES (BURGUNDY) (Micropædia)

COEUR, JACQUES (Micropædia)

LOUIS XI (FRANCE) (Micropædia)

M.Jo. **Matthew Josephson** (d. 1978). *Author of Edison: A Biography.*
EDISON (in part)

M.J.O. **Margaret J. Osler.** *Professor of History, University of Calgary, Alberta.*
PHYSICAL SCIENCES, THE (in part)

M.J.P. **Michael J. Pelczar, Jr.** *Emeritus Vice President for Graduate Studies and*

Research; Emeritus Professor of Microbiology, University of Maryland, College Park. Emeritus President, Council of Graduate Schools. Coauthor of Microbiology; Elements of Microbiology.
BIOLOGICAL SCIENCES, THE (in part)
DISEASE (in part)

M.J.Pi. **Mark Jeffrey Pietka.** *Technical Director, Cadbury Beverages Latin America, Inc., Fort Lauderdale, Florida.*
BEVERAGE PRODUCTION (in part)

M.J.S.B. **Michael J.S. Belton.** *Astronomer, Kitt Peak National Observatory, Tucson, Arizona.*
SOLAR SYSTEM, THE (in part)

M.J.V. **Mark J. Valencia.** *Research Associate, East-West Center, Honolulu. Author of South-East Asian Seas: Oil Under Troubled Waters; coeditor of Atlas for Marine Policy in East Asian Seas.*
PACIFIC OCEAN, THE (in part)

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SPAIN (in part)

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NETHERLANDS, THE (in part)

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STRAUSS, RICHARD (Micropædia)

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PORTUGAL (in part)

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ALCOHOL AND DRUG CONSUMPTION (in part)

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AOL-TIME WARNER (Micropædia)

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IRAQ (in part)

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GODDARD, ROBERT HUTCHINGS (in part)
(Micropædia)

M.K.N. **Mehdi K. Nakosteen** (d. 1982). *Professor of the History and Philosophy of Education, University of Colorado, Boulder. Author of The History and Philosophy of Education.*
EDUCATION, HISTORY OF (in part)

M.Ko. **Mieczysław Kolinski** (d. 1981). *Composer, ethnomusicologist, and author*

of many musical and ethnomusicological articles.

MUSIC, THE ART OF (in part)

M.K.P. **Macaire K. Pedanou.** *Former Director, Office of the Commissioner for Namibia, United Nations, New York City.*
WESTERN AFRICA (in part)

M.Kr. **Melvin Kranzberg** (d. 1995). *Professor of the History of Technology, Georgia Institute of Technology, Atlanta, 1972–88. Editor in Chief, Technology and Culture (quarterly), 1958–81. Coauthor of By the Sweat of Thy Brow: Work in the Western World.*

WORK AND EMPLOYMENT (in part)

M.K.Sp. **Monroe K. Spears.** *Moody Professor of English, Rice University, Houston, Texas. Author of The Poetry of W.H. Auden; Dionysus and the City; editor of W.H. Auden: A Collection of Critical Essays.*

AUDEN, W.H. (Micropædia)

M.K.W. **Marcus K. Williams.** *Senior member of sports staff, The Times (London). Editor of Double Century: 200 Years of Cricket in The Times.*

SPORTS, MAJOR TEAM AND INDIVIDUAL
(in part)

M.L.C. **Martin Lowther Clarke.** *Former Professor of Latin, University College of North Wales, Bangor, University of Wales. Author of Rhetoric at Rome; Higher Education in the Ancient World.*

QUINTILIAN (Micropædia)

M.L.Cl. **Martha L. Clark.** *Special Assistant to the Archivist, Massachusetts State Archives, Boston.*

UNITED STATES OF AMERICA (in part)

M.L.D. **Mikhail Leonidovich Djibladze.** *Journalist.*

TRANSCAUCASIA (in part)

M.Le. **Michel Lejeune.** *Director of Research, National Center for Scientific Research, Paris, 1963–78. Author of Phonétique historique du mycénien et du grec ancien and others.*

LANGUAGES OF THE WORLD (in part)

Ml.F. **Marcel Franciscono.** *Professor of Art History, University of Illinois at Urbana-Champaign. Author of Paul Klee, 1879–1940: His Life and Work and others.*

KLEE, PAUL (Micropædia)

M.L.Go. **Marie Louise Goodnight.** *Freelance writer and researcher. Instructor in Biological Sciences, Purdue University, West Lafayette, Indiana, 1946–65. Coauthor of General Zoology.*

ARACHNIDS (in part)

M.Li. **Martin Lindauer.** *Emeritus Professor of Zoology and Comparative Physiology; Emeritus Director, Zoological Institute, University of Würzburg, Germany. Author of Communication Among Social Bees.*

INSECTS (in part)

M.Ln. **Milton Lehman** (d. 1966). *Freelance writer. Author of This High Man: The Life of Robert H. Goddard.*

GODDARD, ROBERT HUTCHINGS (in part)
(Micropædia)

ML.R. **Michael Roe.** *Professor of History, University of Tasmania, Hobart, Australia. Author of Nine Australian Progressives.*
AUSTRALIA (in part)

M.L.R. **The Hon. Miriam Louisa Rothschild.** *Coauthor of An Illustrated Catalogue of the Rothschild Collection of Fleas (Siphonaptera) in the British Museum (Natural History) and author of many papers on fleas and other insects.*
INSECTS (in part)

M.L.S. **Maurice L. Schwartz.** *Emeritus Professor of Geology, Western Washington University, Bellingham; Dean, Graduate School and Research Bureau, 1987-93. Editor of The Encyclopedia of Beaches and Coastal Environments.*
OCEANS (in part)

M.L.Sc. **Morton L. Schagrin.** *Professor of Philosophy, State University of New York College at Fredonia. Author of The Language of Logic.*

LOGIC, THE HISTORY AND KINDS OF (in part)

M.-L.S.S. **Marie-Louise Stig Sørensen.** *Lecturer in Anthropology and Archaeology; Fellow, Jesus College, University of Cambridge. Coeditor of The Transition from Bronze to Iron Age in Europe.*
EUROPEAN HISTORY AND CULTURE (in part)

M.Lu. **Myron Luntz.** *Professor of Physics, State University of New York College at Fredonia.*

RADIATION (in part)

M.Ma. **Michael Marsh.** *Associate Professor and Head, Department of Political Science, Trinity College, Dublin. Coeditor of How Ireland Voted 1997; Candidate Selection in Comparative Perspective: The Secret Garden of Politics.*
MCALKESE, MARY (Micropædia)
ROBINSON, MARY (Micropædia)

M.McA. **Mary McAuley.** *Fellow and Tutor in Politics, St. Hilda's College, University of Oxford. Author of Politics and the Soviet Union and others.*
SAINT PETERSBURG (in part)

M.McCu. **Marilyn McCully.** *Freelance writer. Author of Picasso: A Private Collection; editor of A Picasso Anthology.*
PICASSO

M.M.E. **Marc Marie Escholier** (d. 1972). *Judge, Supreme Court of Appeal, Paris. Author of Port-Royal and others.*
JANSEN, CORNELIUS OTTO (Micropædia)

M.M.El-K. **Magdi M. El-Kammash** (deceased). *Associate Professor of Economics, North Carolina State University at Raleigh. Author of Economic Development and Planning in Egypt.*
AFRICA (in part)

M.Mi. **Mairin Mitchell.** *Freelance writer. Author of The Odyssey of Acurio Who Sailed with Magellan and others.*
MAGELLAN, FERDINAND (Micropædia)

M.Ml. **Michel Michel.** *Professor of Geography, University of Paris XIII.*
BRAZIL (in part)

M.M.M. **Maynard M. Miller.** *Professor of Geology; Emeritus Dean, College of Mines and Earth Resources; Director, Glaciological and Arctic Sciences Institute,*

University of Idaho, Moscow. Director, Foundation for Glacier and Environmental Research, Pacific Science Center, Seattle, Washington. Author of The Juneau Icefield, Alaska and others.

NORTH AMERICA (in part)
UNITED STATES OF AMERICA (in part)

M.Mn. **Sir Max Mallowan** (d. 1978). *Professor of Western Asiatic Archaeology, University of London, 1947-62. President, British School of Archaeology in Iraq, 1970-78. Archaeologist on staff of the British Museum Expedition to Nineveh, 1931-32; later leader of many other archaeological expeditions. Author of Nimrud and Its Remains and others.*
NINEVEH (Micropædia)

M.M.P. **Mary M. Penrose.** *Professor of Law, University of Oklahoma, Norman.*
WAR CRIME (Micropædia)

M.M.Sa. **Mostafa Moh. Salah.** *Former Director, Institute of Oceanography and Fisheries, Kayed Bey, Alexandria, Egypt. Author of numerous articles on oceanography.*

ATLANTIC OCEAN, THE (in part)

M.M.W. **Maxwell M. Wintrobe, M.D.** (d. 1986). *Professor of Internal Medicine, University of Utah, Salt Lake City, 1943-70. Author of Clinical Hematology.*
BLOOD (in part)

M.N. **Max Neutze.** *Former Deputy Vice-Chancellor, Australian National University, Canberra. Author of Australian Urban Policy.*
AUSTRALIA (in part)

M.Na. **Maurice Nadeau.** *Editor, Lettres Nouvelles and La Quinzaine Littéraire, Paris. Author of Histoire du surréalisme; editor of the Marquis de Sade's Oeuvres and others.*

SADE, MARQUIS DE (in part) (Micropædia)

M.N.D. **Manmath Nath Das.** *Former Vice-Chancellor; former Professor and Head, Department of History, Utkal University, Bhubaneswar, Orissa, India.*
INDIA (in part)

M.N.S. **Malcolm N. Shaw.** *Sir Robert Jennings Professor of International Law, University of Leicester, England. Barrister and founder of the European Consortium of Law. Author of International Law and others.*

INTERNATIONAL LAW

Mo.Gr. **Moshe Greenberg.** *Professor of Bible, Hebrew University of Jerusalem. Author of The Hab/piru and others; editor and translator of The Religion of Israel by Yehezkel Kaufmann.*

JUDAISM (in part)

M.P. **Malcolm Potts.** *Bixby Professor of Population and Family Planning, University of California, Berkeley. Coauthor of The Textbook of Contraceptive Practice and others.*
BIRTH CONTROL

M.Pa. **Marcel Pacaut.** *Emeritus Professor of the History of the Middle Ages; Emeritus Director, Institute of Political Studies, University of Lyon, France. Author of Louis VII et son royaume.*
PHILIP II (FRANCE) (Micropædia)

M.P.B. **Michael Parker Banton.** *Emeritus Professor of Sociology, University of Bristol, England. Author of The Policeman in the Community.*

POLICE (in part)

M.P.G. **Mikell P. Groover.** *Professor of Industrial Engineering; Director, Manufacturing Technology Laboratory, Lehigh University, Bethlehem, Pennsylvania. Author of Automation, Production Systems, and Computer-Integrated Manufacturing.*
AUTOMATION

M.Ph. **Melba Phillips.** *Emerita Professor of Physics, University of Chicago. Coauthor of Classical Electricity and Magnetism.*
ELECTROMAGNETIC RADIATION (in part)

M.Pl. **Maurice Platnauer** (d. 1974). *Principal of Brasenose College, University of Oxford, 1956-60. Author of Latin Elegiac Verse and others; editor of Aristophanes' Peace.*

GREEK DRAMATISTS, THE CLASSICAL (in part)

M.Pm. **Dame Margery Perham** (d. 1982). *Fellow of Nuffield College, Oxford, 1939-63; Reader in Colonial Administration, University of Oxford, 1939-48. Author of Lugard; coeditor of The Diaries of Lord Lugard.*

LUGARD OF ABINGER, FREDERICK JOHN
DEALTRY LUGARD, BARON (Micropædia)

M.P.Pe. **Mikhail Platonovich Petrov** (d. 1978). *Professor of Physical Geography, Leningrad A.A. Zhdanov State University. Author of Pustyni Tsentralnoy Azi ("Deserts of Central Asia").*
ASIA (in part)

M.P.S. **Malcolm P. Stevens.** *Professor of Chemistry, University of Hartford, West Hartford, Connecticut. Author of Polymer Chemistry: An Introduction.*
INDUSTRIAL POLYMERS (in part)

M.Py. **E. Michael Pye.** *Professor of Comparative Religion, Philipps University of Marburg, Germany. Author of Skilful Means: A Concept in Mahayana Buddhism and others.*

rites and ceremonies, sacred (in part)

M.R. **Mario Rossi** (deceased). *Professor of the History of Philosophy, University of Siena, Italy. Author of Marx e la dialettica hegeliana.*

HEGELIANISM, HEGEL AND (in part)

M.Ra. **Marc Raeff.** *Bakhtmeteff Professor Emeritus of Russian Studies, Columbia University. Author of Origins of the Russian Intelligentsia and others.*
RUSSIA (in part)

M.R.B. **Merton R. Bernfield, M.D.** *Clement A. Smith Professor of Pediatrics; Director, Joint Program in Neonatology, Harvard University.*
CELLS (in part)

M.R.D. **Mary R. Dawson.** *Curator, Vertebrate Fossils, Carnegie Museum of Natural History, Pittsburgh, Pennsylvania. Active in research on the biology and paleontology of rabbits.*
MAMMALS (in part)

M.R.Da. Milton Rockwood Daniels (deceased). *Commodore, U.S. Coast Guard.*

NAVIGATION (in part)

M.R.D.F. Michael Richard Daniell Foot. *Professor of History, Victoria University of Manchester, England, 1967–73. Editor of The Gladstone Diaries (vol. 1–4).*

GLADSTONE, WILLIAM EWART (in part)
(Micropædia)

M.Re. Marcel Reinhard (d. 1973). *Professor of History, University of Paris. Author of Le Grand Carnot and others.*
SAINT-JUST, LOUIS DE (Micropædia)

M.R.G. Mark Richard Greene. *Distinguished Professor Emeritus of Insurance, University of Georgia, Athens. Coauthor of Risk and Insurance.*
INSURANCE

M.Rh. Max Rheinstein (d. 1977). *Max Pam Professor of Comparative Law, University of Chicago, 1942–68. Coauthor of Law of Decedents' Estates.*

INHERITANCE AND SUCCESSION (in part)
LEGAL SYSTEMS, THE EVOLUTION OF MODERN WESTERN (in part)
PROCEDURAL LAW (in part)

M.R.H. Michael R. House. *Professor of Geology, University of Southampton, England. Author of Continental Drift and the Devonian System and others.*
GEOCHRONOLGY (in part)

M.R.McL. Mark R. McLellan. *Associate Professor and Interim Chairman, Department of Food Science and Technology, Cornell University.*
FOOD PROCESSING (in part)

M.Ro. Michael Roberts. *Professor of Modern History, Queen's University of Belfast, Northern Ireland, 1954–73. Author of Gustavus Adolphus: A History of Sweden, 1611–1632; The Early Vasas: A History of Sweden, 1523–1611.*
GUSTAV II ADOLF (Micropædia)
OXENSTIERNA (AF SODERMORE), AXEL, GREVE (Micropædia)

M.R.S. Michael R. Swaine. *Coauthor of Fire in the Valley: The Making of the Personal Computer.*
COMPUTERS (in part)

M.R.W. Marilyn R. Waldman (d. 1996). *Professor of History and Comparative Studies, Ohio State University, Columbus. Author of Toward a Theory of Historical Narrative: A Case Study in Perso-Islamicate Historiography.*
ISLAMIC WORLD, THE

M.S. Marius Sala. *Director, Institute of Linguistics, Bucharest, Romania. Coeditor of Enciclopedia limbilor romanice.*
LANGUAGES OF THE WORLD (in part)

M.Sa. Michele Sarà. *Professor of Zoology, University of Genoa, Italy. Author of Zoologia; Biologia generale.*
SPONGES (in part)

M.S.A. Mikhail S. Arlazorov. *Former staff member, Union of Cinematographers, Moscow. Author of Tsiolkovsky.*
TSIOLKOVSKY, KONSTANTIN EDUARDOVICH (Micropædia)

M.Sal. Mario Salmi (d. 1980). *Professor of the History of Medieval and Modern Art, University of Rome. Author of Il Beato Angelico and many monographs on Italian Renaissance artists.*
ANGELICO, FRA (Micropædia)

M.S.An. Matthew Smith Anderson. *Emeritus Professor of International History, University of London. Author of Europe in the Eighteenth Century, 1713–1783 and others.*
FREDERICK THE GREAT

M.S.C. Maria S. Cox. *Former Assistant Professor of Economics, University of Wisconsin, Madison.*
TAXATION (in part)

M.Sch. Mischa Schwartz. *Charles Batchelor Professor of Electrical Engineering, Columbia University. Author of Information Transmission, Modulation, and Noise; Telecommunication Networks.*
TELECOMMUNICATIONS SYSTEMS (in part)

M.S.D. Margaret Stefana Drower. *Fellow of University College, London; former Reader in Ancient History, University of London. Author of Nubia: A Drowning Land and others.*
THUTMOSE III (Micropædia)

M.S.F. Manfred S. Frings. *Emeritus Professor of Philosophy, DePaul University, Chicago. Director, The Max Scheler Archives, Albuquerque, New Mexico, and Munich, Germany. Editor, The Collected Works of Max Scheler. Author of Max Scheler: A Concise Introduction into the World of a Great Thinker and others.*
SCHELER, MAX (in part) (Micropædia)

M.S.F.H. M. Sinclair F. Hood. *Archaeologist. Director, British School at Athens, 1954–62. Author of The Minoans.*
GREEK AND ROMAN CIVILIZATIONS, ANCIENT (in part)

M.Sh. Minoru Shinoda. *Emeritus Professor of History, University of Hawaii at Manoa, Honolulu. Author of The Founding of the Kamakura Shogunate 1180–1185.*
DAIGO, GO- (Micropædia)
FUJIWARA FAMILY (Micropædia)

M.S.H. Muhammad Shamsul Huq. *President, Foundation for Research on Educational Planning and Development. Foreign Minister, Bangladesh, 1978–82. Minister for Education and Scientific Research, Pakistan, 1969–71. Author of Education and Manpower Development in South and Southeast Asia and others.*
EDUCATION, HISTORY OF (in part)

M.Si. Masayoshi Shibatani. *Professor of Linguistics, Kôbe University, Japan. Author of The Languages of Japan.*
LANGUAGES OF THE WORLD (in part)

M.S.Ki. M. Semakula M. Kiwanuka. *Representative of Uganda to the United Nations. Dean, School of Post-Graduate Studies and Research, Makerere University, Kampala, Uganda, 1991–94. Author of A History of Buganda.*
EASTERN AFRICA (in part)

M.S.M. Muhsin S. Mahdi. *James Richard Jewett Professor of Arabic,*

Harvard University. Author of Ibn Khaldun's Philosophy of History.
ISLĀM, MUḤAMMAD AND THE RELIGION OF (in part)

M.S.Ma. Matthew S. Magda. *Adjunct Instructor in History, Sacred Heart University, Fairfield, Connecticut. Former Associate Historian, Division of History, Pennsylvania Historical and Museum Commission, Harrisburg.*
PHILADELPHIA (in part)

M.S.M.F. Michael S.M. Fordham (d. 1995). *Analytical psychologist. Coeditor of The Collected Works of C.G. Jung.*
JUNG, CARL (in part) (Micropædia)

M.Sp. Matthew Spinka (d. 1972). *Professor of Church History, Hartford Seminary Foundation, Connecticut, 1943–58. Author of John Hus: A Biography and others.*
HUS, JOHN (in part) (Micropædia)

M.S.S. Mark S. Slobin. *Professor of Music, Wesleyan University, Middletown, Connecticut. Author of Music in the Culture of Northern Afghanistan and others.*
CENTRAL ASIAN ARTS (in part)

M.St. Michel Strickmann (deceased). *Associate Professor of Oriental Languages, University of California, Berkeley. Author of Le Taoïsme du Mao Chan.*
TAOISM (in part)

M.S.T. Michael S. Teitelbaum. *Program Officer, Alfred P. Sloan Foundation, New York City. Author of The British Fertility Decline: Demographic Transition in the Crucible of the Industrial Revolution.*
POPULATION

M.Su. Michael Sullivan. *Christensen Professor Emeritus of Oriental Art, Stanford University, California. Author of The Birth of Landscape Painting in China; The Arts of China.*
MA YÜAN (Micropædia)
EAST ASIAN ARTS (in part)

M.T. Morris Tanenbaum. *Vice-Chairman and Chief Financial Officer, AT&T Company, New York City, 1986–91. Coeditor of Superconductors.*
INDUSTRIAL ENGINEERING AND PRODUCTION MANAGEMENT (in part)

M.Ta. Mohamed Talbi. *Emeritus Professor, Faculty of Letters and Human Sciences, University of Tunis, Tunisia. Author of L'Emirat aghlabide, histoire politique 800–909.*
NORTH AFRICA (in part)

M.T.C. Marjorie Tuainekore Crocombe. *Former Director, Centre for Pacific Studies, University of Auckland, New Zealand. Author of They Came for Sandalwood.*
PACIFIC ISLANDS (in part)

M.T.F. Michael T. Florinsky (d.1981). *Professor of Economics, Columbia University, 1956–63. Author of Russia: A History and an Interpretation and others.*
ALEXANDER III (RUSSIA) (Micropædia)

M.T.G. Michael T. Ghiselin. *Senior Research Fellow, California Academy of Sciences, San Francisco. Author of The Triumph of the Darwinian Method.*
CHORDATES (in part)

M.T.J. Malcolm T. Jollie. *Professor of Biological Sciences, Northern Illinois University, De Kalb, 1965–88. Author of Chordate Morphology.*

CHORDATES (in part)

M.T.O. Martin T. Orne, M.D. *Professor of Psychiatry, University of Pennsylvania, Philadelphia; Director, Unit for Experimental Psychiatry, Institute of Pennsylvania Hospital.*

HYPNOSIS (in part) (Micropædia)

M.Tu. Martin Turnell (d. 1979). *Writer. Head, Programme Contracts Department, British Broadcasting Corporation, London, 1959–69. Author of The Art of French Fiction.*

MAUPASSANT, GUY DE (in part)
(Micropædia)

M.T.V. M. Tulio Velásquez. *Director, Institute of Andean Biology, National University of San Marcos, Lima, Peru. Coauthor of Physiological Effects of High Altitude.*

SOUTH AMERICA (in part)

M.U. Michitaka Uda. *Emeritus Professor, Tokyo University of Fisheries. Author of Umi and numerous articles on oceanography.*

PACIFIC OCEAN, THE (in part)

Mu.B. Mukhtar Mustafa Buru. *Professor of Geography, Al-Fatah University, Tripoli, Libya. Author of Atlas of Libyan Arab Republic.*

NORTH AFRICA (in part)

Mu.McC. Murray McCaskill. *Emeritus Professor of Geography, Flinders University of South Australia, Adelaide. Author of Patterns on the Land; editor of Australian Geographical Studies.*

AUSTRALIA (in part)

Mu.S. Murray Schumach. *Former Reporter, The New York Times. Author of The Face on the Cutting Room Floor.*

NEW YORK CITY

Muz.A. Muzaffar Alam. *Professor of Medieval Indian History, Centre for Historical Studies, Jawaharlal Nehru University, New Delhi. Author of The Crisis of Empire in Mughal North India: Awadh and the Punjab, 1707–1748.*

INDIA (in part)

M.V. Meredith Veldman. *Assistant Professor of History, Louisiana State University, Baton Rouge.*

VICTORIA AND THE VICTORIAN AGE (in part)

M.v.C. Martin van Creveld. *Professor of History, Hebrew University of Jerusalem. Author of The Transformation of War and others.*

WAR, THE THEORY AND CONDUCT OF
(in part)

M.V.F. Marion Valerie Friedmann (d. 1980). *Editor and translator. Author of The Slap; editor of I Will Still Be Moved: Reports from South Africa.*

SOUTH AFRICAN LITERATURE (in part)
(Micropædia)

M.Vi. Marcelle Vioux (deceased). *Freelance writer. Author of François I; Henri IV; and others.*

FRANCIS I (FRANCE) (Micropædia)

M.V.O. Maynard V. Olson. *Professor of Molecular Biotechnology, University of Washington, Seattle. Author of papers on mechanisms of reactions of transition-metal compounds.*

CHEMICAL REACTIONS (in part)

M.W. Michael Widom. *Professor of Physics, Carnegie Mellon University, Pittsburgh, Pennsylvania. Author of Renormalization Group Analysis of Quasi-Periodicity in Analytic Maps.*

MATTER (in part)

M.W.B. Marshall W. Baldwin (d. 1975). *Professor of History, New York University, New York City, 1954–72. Coeditor of A History of the Crusades.*

CRUSADES, THE (in part)

M.W.DeL. Mark W. DeLancey. *Professor of Government and International Studies, University of South Carolina, Columbia. Author of Cameroon.*

WESTERN AFRICA (in part)

M.We. Martin Weinstein. *Professor of Political Science, William Paterson University, New Jersey. Author of Uruguay: Democracy at the Crossroads and others.*

URUGUAY (in part)

M.W.F. Marvin W. Formo. *Former Manager, Oil and Protein Research, Cargill Inc., Minneapolis, Minnesota. Contributor to Industrial Fatty Acids.*

FOOD PROCESSING (in part)

M.W.Fo. Michael W. Fox. *Vice President, The Humane Society of the United States, Washington, D.C. Author of Superdog.*

CATS, DOMESTIC (in part)

M.W.Fr. Michael Wulf Friedlander. *Professor of Physics, Washington University, St. Louis, Missouri. Author of Astronomy: From Stonehenge to Quasars and others.*

COSMIC RAY (Micropædia)

PHYSICAL SCIENCES, THE (in part)

M.W.G. Malcolm W. Greaves. *Professor of Dermatology, Institute of Dermatology, St. Thomas's Hospital, University of London. Editor of The Urticarias.*

INTEGUMENTARY SYSTEMS (in part)

M.W.H. Marcus Willem Heslinga. *Emeritus Professor of Human Geography, Free University, Amsterdam.*

NETHERLANDS, THE (in part)

M.Wi. Mitchell Wilson (d. 1973). *Science writer and novelist. Author of American Science and Invention.*

MCCORMICK, CYRUS HALL (Micropædia)

M.W.L. Maung Wai Lin. *Research Editor, Biology, Encyclopædia Britannica, Chicago, 1970–72.*

FISHES (in part)

M.W.L.K. Michael William Lely Kitson. *Director of Studies, Paul Mellon Centre for Studies in British Art, London, 1986–92. Author of The Art of Claude Lorrain.*

CLAUDE LORRAIN (in part) (Micropædia)

M.W.M. Marvin W. Mikesell. *Professor of Geography, University of Chicago. Author of Northern Morocco: A Cultural Geography.*

AFRICA (in part)

M.Wo. Mary Woodall (d. 1988). *Director, City Museum and Art Gallery, Birmingham, England, 1956–64. Author of Gainsborough's Landscape Drawings; editor of The Letters of Thomas Gainsborough.*

GAINSBOROUGH, THOMAS (Micropædia)

M.W.Ri. Michael William Richey. *Former Director, Royal Institute of Navigation, London. Coauthor of The Geometrical Seaman; The Encyclopedia of Sailing.*

NAVIGATION (in part)

M.W.W. Manfred W. Wenner. *Professor of Political Science, Northern Illinois University, De Kalb. Author of Modern Yemen, 1918–1966 and others.*

ARABIA (in part)

M.Y.S. Margaret Yvonne Stant. *Principal Scientific Officer in Plant Anatomy, Jodrell Laboratory, Royal Botanic Gardens, Kew, England. Author of Anatomy of the Butomaceae.*

ANGIOSPERMS (in part)

M.Z. Moses Zucker (d. 1987). *Professor of Biblical Exegesis, Jewish Theological Seminary of America, New York City. Author of Rav Saadya Gaon's Translation of the Torah.*

SA ADIA BEN JOSEPH (Micropædia)

M.Zu. Matinuzzaman Zuberi. *Senior Fellow and Head, Centre for International Politics and Organization, Jawaharlal Nehru University, New Delhi.*

NEPAL (in part)

N. John Julius Cooper, 2nd Viscount Norwich. *Writer and broadcaster. Author of The Normans in the South; The Kingdom in the Sun.*

ROGER II (SICILY) (Micropædia)

N.A. Nafis Ahmad (deceased). *Professor of Geography, University of Dacca, Bangladesh. Author of Economic Geography of East Pakistan; editor of Oriental Geographer.*

ASIA (in part)

N.Ab. Nicola Abbagnano (d. 1990). *Professor of History of Philosophy, University of Turin, Italy, 1936–76. Foremost Italian Existentialist philosopher. Author of Critical Existentialism and others.*

PHILOSOPHICAL SCHOOLS AND DOCTRINES,
WESTERN (in part)

N.A.Ba. Nicholas A. Barr. *Senior Lecturer in Economics, London School of Economics and Political Science, University of London. Author of The Economics of the Welfare State.*

UNITED KINGDOM (in part)

N.A.C. Nancy A. Curtin. *Senior Lecturer in Physiology, Charing Cross and Westminster Medical School, University of London.*

MUSCLES AND MUSCLE SYSTEMS (in part)

N.A.F. Nabih Amin Faris (d. 1968). *Professor of Arab History and Director, Arab Studies Programme, American University of Beirut, Lebanon.*

PALESTINE (in part)

N.A.G. Nikolay Andreyevich Gvozdetzky. *Emeritus Professor of Geography, Moscow M.V. Lomonosov State University. Author of Kavkaz.*

ASIA (in part)

TRANSCAUCASIA (in part)

N.A.J. Nazir Ali Jairazbhoy. *Emeritus Professor of Ethnomusicology, University of California, Los Angeles. Author of The Rāgs of North Indian Music: Their Structure and Evolution.*

SOUTH ASIAN ARTS (in part)

Na.M. Nancy Mitford (d. 1973). *Writer. Author of Madame de Pompadour and others.*

POMPADOUR, JEANNE-ANTOINETTE POISSON, MARQUISE DE (Micropædia)

N.A.M. Norman A. Malcolm (d. 1990). *Susan Linn Sage Professor of Philosophy, Cornell University, Ithaca, New York, 1964–78. Author of Ludwig Wittgenstein: A Memoir.*

WITTGENSTEIN, LUDWIG (in part)
(Micropædia)

Na.Mo. Naoaki Maeno. *Emeritus Professor of Chinese Literature, University of Tokyo. Author of Poets in the T'ang Dynasty.*

LITERATURE, THE ART OF (in part)

N.An. Nikolay Andreyev (d. 1982). *Reader in Russian Studies, University of Cambridge; Fellow of Clare Hall, Cambridge. Author of Studies in Muscovy and others.*

IVAN IV (in part) (Micropædia)

N.A.O. Ned Allen Ostenso. *Assistant Administrator for Oceanic and Atmospheric Research, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Rockville, Maryland. Leader or participant in several polar expeditions. Author of Geophysical Investigations of the Arctic Ocean Basin.*

ARCTIC, THE (in part)

N.A.R. Nesca A. Robb (d. 1976). *Freelance writer and lecturer. Author of William of Orange: A Personal Portrait.*

WILLIAM III (ENGLAND AND GREAT BRITAIN)

(Micropædia)

N.A.Ro. Nicholas A. Romas, M.D. *Director of Urology, St. Luke's-Roosevelt Hospital Center, New York City.*

REPRODUCTION AND REPRODUCTIVE SYSTEMS (in part)

N.A.W. Nixon A. Wilson. *Professor of Biology, University of Northern Iowa, Cedar Falls. Author of numerous papers on mites and ticks.*

ARACHNIDS (in part)

N.A.Z. Nicola Abdo Ziadeh. *Emeritus Professor of Arab History, American University of Beirut. Author of Origins of Nationalism—Tunisia and others.*

BOURGUIBA, HABIB (in part) (Micropædia)

CALENDAR (in part)

HISTORY, THE STUDY OF (in part)

N.B. Nevill Barbour (d. 1972). *Assistant Head, Eastern Services, British Broadcasting Corporation, 1944–56. Author of Morocco; editor of A Survey of North West Africa.*

NORTH AFRICA (in part)

N.B.P. Nicholas B. Penny. *Cloze Curator of Renaissance Paintings, National Gallery, London. Author of The Materials of Sculpture and others.*

PAINTING, THE HISTORY OF WESTERN (in part)

SCULPTURE, THE HISTORY OF WESTERN (in part)

N.C.G. Neil C. Gustafson. *President, Anticipatory Management, Inc., Minneapolis. Coauthor and editor of Report of the Commission on Minnesota's Future; coauthor of Atlas of Minnesota Resources and Settlement.*

UNITED STATES OF AMERICA (in part)

N.Ch. Ned Chaillet. *Editor, Radio Drama, British Broadcasting Corporation, London.*

THEATRE, THE ART OF THE (in part)

N.C.H. Nicholas Carr Hightower, M.D. *Senior Consultant, Department of Gastroenterology, Scott and White Clinic and Scott and White Memorial Hospital, Temple, Texas. Contributor of "Digestion" in Best and Taylor, The Physiological Basis of Medical Practice (8th ed.).*

DIGESTION AND DIGESTIVE SYSTEMS (in part)

N.C.N. Norman Cornthwaite Nicholson (d. 1987). *Poet and critic. Author of H.G. Wells and others.*

WELLS, H.G. (in part) (Micropædia)

N.Co. Nigel Collins. *Editor in Chief, The Ring, 1985–89. Editor, Boxing Illustrated, 1984.*

SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

N.C.P. Norman C. Polmar. *Consultant. Editor, U.S. sections, Jane's Fighting Ships, 1967–77. Author of Atomic Submarines and others.*

WAR, THE TECHNOLOGY OF (in part)

N.C.W. Neil C. Wells. *Lecturer in Meteorology and Physical Oceanography, University of Southampton, England. Author of The Atmosphere and Ocean.*

OCEANS (in part)

N.D. Norman Davies. *Professor of Polish History, School of Slavonic and East European Studies, University of London. Author of God's Playground: A History of Poland.*

POLAND (in part)

WARSAW (in part)

N.D.B. Ninotchka Devorah Bennahum. *Assistant Professor of Performance Studies and Theatre, Long Island University, New York. Author of Antonia Mercé, "La Argentina": Flamenco and the Spanish Avant-Garde.*

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N.E.L. Nancy Ellen Lawler. *Professor of History and Economics, Oakton Community College, Des Plaines, Illinois.*

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Ne.P. Neil Parsons. *Associate Professor of History, University of Botswana, Gaborone. Author of A New History of Southern Africa; editor of Botswana Society Social Studies Atlas.*

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N.E.S. Neil E. Salisbury. *Professor of Geography, University of Oklahoma, Norman. Coauthor of "Growth and Decline of Iowa Villages" and "The Valleys of Iowa," Iowa Studies in Geography.*

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N.E.Sa. Nigel E. Saul. *Professor of Medieval History, Royal Holloway, University of London. Author of Richard II.*

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N.F. Norman Friedman. *Defense consultant. Visiting Professor of Operations Research, University College, University of London. Author of The Postwar Naval Revolution and many others.*

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N.F.C. Norman F. Childers. *Adjunct Professor, Department of Horticultural Sciences, University of Florida, Gainesville. M.A. Blake Professor Emeritus of Horticulture, Rutgers University, New Brunswick, New Jersey. Author of Modern Fruit Science.*

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PEEL, SIR ROBERT, 2ND BARONET (Micropædia)

N.G.C. Noel G. Coley. *Honorary Visiting Research Fellow, The Open University, Milton Keynes, Buckinghamshire, England. Coauthor of Chemistry, Society and Environment: A New History of the British Chemical Industry.*

AVOGADRO, AMEDEO (Micropædia)

N.G.J. Norman Gardner Johnson (d. 1973). *Industry Manager, Explosives Department, Du Pont de Nemours and Company, Wilmington, Delaware, 1960–67; Technical Specialist, Technical Service Section, 1943–60. Author of Safety in the Transportation, Storage, Handling and Use of Explosives.*

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N.Go. Noël Goodwin. *Associate Editor, Dance and Dancers, London. Member, Editorial Board, Opera. Assistant Music Critic, The Times (London). Area Editor, The New Grove Dictionary of Music and Musicians. Coauthor of London Symphony: Portrait of an Orchestra.*

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PUBLIC WORKS (in part)

N.J.B. N.J. Berrill. *Strathcona Professor of Zoology, McGill University, Montreal, 1946–65. Author of Sex and the Nature of Things and others.*

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LEARNING, ANIMAL

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AFRICA (in part)

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ASIA (in part)

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N.Ka. Nobuo Kanda. *Emeritus Professor of East Asian History, Meiji University, Tokyo. Author of Rise and Fall of the Ch'ing Dynasty.*

K'ANG-HSI (Micropædia)

N.K.B.R. Norman K.B. Robson. *Former Principal Scientific Officer, Department of Botany, British Museum (Natural History), London. Editor, Botanical Journal of the Linnean Society, 1969–77. Editor of Principles of Plant Taxonomy.*

ANGIOSPERMS (in part)

N.K.S. N.K. Sinha (d. 1974). *Professor and Head, Department of History, University of Calcutta, 1955–68. Author of Rise of the Sikh Power.*

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N.L.G. Nancie L. González. *Emerita Professor of Anthropology, University of Maryland, College Park. Author of Sojourners of the Caribbean and others.*

WEST INDIES, THE (in part)

N.L.J. Neil L. Jamieson. *Program Officer, Winrock International Institute for Agricultural Development, Hanoi, Vietnam. Senior Associate, Indochina Institute, George Mason University, Fairfax, Virginia. Author of Understanding Vietnam and others.*

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N.L.N. Norman L. Nicholson. *Senior Professor of Geography, University of Western Ontario, London. Author of The Boundaries of the Canadian Confederation and others.*

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UNITED STATES OF AMERICA (in part)

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N.M.Sa. Nahum M. Sarna. *Golding Professor Emeritus of Biblical Studies, Brandeis University. Author of Understanding Genesis and others.*

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ASIA (in part)

N.N.G. Nahum N. Glatzer (d. 1990). *Professor of Jewish History, Brandeis University, Waltham, Massachusetts, 1956–73. Author of Franz Rosenzweig: His Life and Thought and others.*

AKIBA BEN JOSEPH (Micropædia)

ROSENZWEIG, FRANZ (Micropædia)

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BULTMANN, RUDOLF (Micropædia)

N.Pa. Ntsomo Payanzo. *Former Assistant Professor of Sociology, National University of Zaire, Lubumbashi.*

CENTRAL AFRICA (in part)

N.P.A. Nagarajan Panchapagesan Ayyar (d. 1979). *Professor of Geography, Shivaji University, Kolhāpur, India, 1977–79.*

INDIA (in part)

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BIRDS (in part)

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LOGIC, THE HISTORY AND KINDS OF (in part)

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MUSCLES AND MUSCLE SYSTEMS (in part)

N.R.M. Noel R. Malcolm. *Historian and writer. Visiting Fellow, St. Antony's College, University of Oxford, 1995–96. Author of Bosnia: A Short History.*
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SOUTH AMERICA (in part)

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GUICCIARDINI, FRANCESCO (Micropædia)

N.R.W. Nelson Raymond Williams. *Principal Technical Adviser to Assistant Director, U.S. Air Force Technical Applications Center, Virginia, 1961–63. Meteorologist, U.S. Weather Bureau, 1940–46. Contributor to The Encyclopedia of Atmospheric Sciences and Astrogeology.*
CLIMATE AND WEATHER (in part)

N.S. Nobuo Shimahara. *Professor of the Anthropology of Education, Rutgers University, New Brunswick, New Jersey. Author of Adaptation and Education in Japan and others.*
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N.S.B. Norman Spencer Brommelle (d. 1989). *Secretary-General, International Institute for Conservation of Historic and Artistic Works, 1957–64 and 1966–87. Director, Hamilton Kerr Institute, Fitzwilliam Museum, University of Cambridge, 1978–83. Keeper, Department of Conservation, Victoria and Albert Museum, London, 1960–77.*
ARTS, PRACTICE AND PROFESSION OF THE (in part)

N.S.C. Neil S. Cherniack, M.D. *Professor of Medicine and Physiology; Dean, School of Medicine, Case Western Reserve University, Cleveland, Ohio. Coeditor of Handbook of Physiology, sect. 3, The Respiratory System, vol. 2, Control of Breathing.*
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N.S.G. Norton S. Ginsburg. *Emeritus Professor of Geography, University of Chicago. Coauthor and coeditor of The Extended Metropolis: Settlement Transition in Asia and others.*
TAIWAN (in part)

N.Sh. Nicholas Shrimpton. *Fellow and Tutor in English Literature, Lady Margaret Hall, University of Oxford. Editor of Matthew Arnold: Selected Poetry; coeditor of The Whole Music of Passion: New Essays on Swinburne.*
ENGLISH LITERATURE (in part)
RUSKIN, JOHN (Micropædia)

N.Sl. Nicolas Slonimsky (d. 1995). *Conductor, composer, writer, and editor. Lecturer in Music, University of California, Los Angeles, 1964–67. Editor, Baker's Biographical Dictionary of Musicians, 1949–93. Author of Music Since 1900; Music of Latin America.*
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POUND, EZRA (Micropædia)

N.T. Nicholas Temperley. *Professor of Musicology, University of Illinois at Urbana-Champaign. Author of The Music of the English Parish Church.*
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SANTAYANA, GEORGE (Micropædia)

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NICHOLAS I (RUSSIA) (Micropædia)
RUSSIA (in part)

N.W. Norman Ward (d. 1990). *Brinell Professor of Political Science, University of Saskatchewan, Saskatoon, 1967–85. Author of The Government of Canada.*
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N.W.D. Norman Wilfred Desrosier. *Former Director of Research, National Biscuit Company, New York City. Author of The Technology of Food Preservation.*
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SOCIAL STRUCTURE AND CHANGE

N.W.S. Nathan Wetherill Shock (d. 1989). *Chief, Gerontology Research Center, National Institute on Aging, U.S. Department of Health, Education, and Welfare, Baltimore, Maryland, 1941–76. Author of Trends in Gerontology; editor of Perspectives in Experimental Gerontology.*
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N.W.U. Natalie W. Uhl. *Emeritus Professor of Botany, Liberty Hyde Bailey Hortorium, Cornell University, Ithaca, New York. Coauthor of Genera Palmarum: A Classification of Palms Based on the Work of Harold E. Moore, Jr.*
ANGIOSPERMS (in part)

N.Z. Nicolas M. Zernov (d. 1980). *Spalding Lecturer in Eastern Orthodox Culture, University of Oxford, 1947–66. Author of The Russian Religious Renaissance of the Twentieth Century.*

KHOMYAKOV, ALEKSEY STEPANOVICH (in part) (Micropædia)

O.A. Oskar Anweiler. *Professor of Education, University of the Ruhr, Bochum, Germany. Author of Geschichte der Schule und Pädagogik in Russland, vom Ende des Zarenreiches bis zum Beginn der Stalin-Ära.*
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LEŚNIEWSKI, STANISŁAW (Micropædia)

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KYŌTO (in part)

O.C.C. Orville C. Cromer (d. 1980). *Professor of Mechanical Engineering, Purdue University, West Lafayette, Indiana, 1954–63. Coauthor of Elementary Heat Power.*
ENERGY CONVERSION (in part)
TRANSPORTATION (in part)

O.C.K. Otto C. Kopp. *Professor of Geological Sciences, University of Tennessee, Knoxville.*
FUELS, FOSSIL (in part)

O.D. Oliver Davies (deceased). *Associate Professor of Archaeology, University of Ghana, 1952–66.*
WESTERN AFRICA (in part)

O.E.Z. Oleksa Eliseyovich Zasenkov. *Writer. Head, Department of the History of Ukrainian Prerevolutionary Literature, Institute of Literature, Ukrainian S.S.R. Academy of Sciences, Kiev, 1950–75. Coauthor of History of Ukrainian Literature (vol. 8).*
UKRAINE (in part)

O.F.B. Otto Friedrich Bollnow. *Emeritus Professor of Philosophy and Education, Eberhard Karl University of Tübingen, Germany. Author of Diltthey: Eine Einführung in seine Philosophie.*
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O.G. Owen Gingerich. *Professor of Astronomy and of the History of Science, Harvard University. Senior Astronomer, Smithsonian Astrophysical Observatory, Cambridge, Massachusetts. Author of The Eye of Heaven: Ptolemy, Copernicus, Kepler.*
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O.Gr. Oleg Grabar. *Professor, School of Historical Studies, Institute for Advanced Study, Princeton, New Jersey. Aga Khan Professor of Islamic Art, Harvard University 1981–90. Author of The Formation of Islamic Art; coauthor of The Art and Architecture of Islam 650–1250.*
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O.H.K. Omari H. Kokole. *Associate Director, Institute of Global Cultural Studies, State University of New York at Binghamton.*

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O.J. Oswald Jacoby (d. 1984). *Author of Oswald Jacoby on Poker and many other works on card playing.*

POKER (Micropædia)

O.J.B. Ooi Jin Bee. *Professor of Geography; Professorial Fellow, National University of Singapore. Author of Peninsular Malaysia and others.*

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O.J.E. Olin Jeuck Eggen. *Senior Astronomer, Cerro Tololo Interamerican Observatory, La Serena, Chile.*

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HALLEY, EDMOND (Micropædia)

O.J.H. Oscar J. Hammen. *Emeritus Professor of History, University of Montana, Missoula. Author of The Red '48ers: Karl Marx and Friedrich Engels.*

ENGELS, FRIEDRICH (Micropædia)

O.K.-J. Ole Klindt-Jensen (d. 1980). *Professor of Prehistory, University of Aarhus, Denmark, 1961–80. Author of Foreign Influences in Denmark's Early Iron Age; Denmark Before the Vikings.*

PAINTING, THE HISTORY OF WESTERN (in part)

O.K.L. Oleg Konstantinovich Leontiev (d. 1988). *Professor and Head, Department of Geomorphology, Moscow M.V. Lomonosov State University.*

ASIA (in part)

O.L. Otto Leichter (d. 1973). *Correspondent for United Nations and U.S. Affairs, Arbeiter-Zeitung, Vienna; and Neue Ruhr-Zeitung, Essen, West Germany. Author of Zwischen zwei Diktaturen.*

AUSTRIA (in part)

O.La. Owen Lattimore (d. 1989). *Professor of Chinese Studies, University of Leeds, England, 1963–70. Author of Mongols of Manchuria and others.*

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O.L.A. Oliver L. Austin, Jr. (d. 1988). *Curator in Ornithology, Florida State Museum, University of Florida, Gainesville, 1957–73. Author of Birds of the World and other numerous papers.*

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O.L.Z. Oliver Louis Zangwill (d. 1987). *Professor of Experimental Psychology, University of Cambridge, 1952–81. Author of An Introduction to Modern Psychology; coeditor of Amnesia.*

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O.O. Otakar Odlozilik (d. 1973). *Professor of European History, University of Pennsylvania, Philadelphia, 1955–70. Author of Bohemia in European Affairs, 1440–1471.*

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O.O.W. Oscar O. Winther (d. 1970). *University Professor of History, Indiana University, Bloomington, 1965–70. Author of The Great Northwest.*

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O.R.A.K. Oswin R.A. Köhler. *Emeritus Professor of African Studies; former Director, Institute for African Studies, University of Cologne, West Germany. Author of Die Kxoe-Buschleute und ihre ethnische Umgebung and others.*

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O.Sh. O. Shagdarsuren. *Former Director, Institute of General and Experimental Biology, Academy of Sciences, Ulaanbaatar, Mongolia.*

MONGOLIA (in part)

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P.A. Paul Avrich. *Distinguished Professor of History, Queens College, City University of New York, Flushing. Author of The Russian Anarchists.*

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Pa.A. Paul Arthur. *Professor of Politics, University of Ulster, Jordanstown, Northern Ireland. Author of Government and Politics of Northern Ireland.*

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HUME, JOHN (in part) (Micropædia)

IRISH REPUBLICAN ARMY (in part)

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P.A.F. Paul A. Freiberger. *Coauthor of Fire in the Valley: The Making of the Personal Computer.*

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Pa.H. Pauline Heaton. *Former Acting Archivist, Bermuda.*

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P.A.H. Patrick Aidan Heelan. *Emeritus Professor of Philosophy, State University of*

New York at Stony Brook. Author of Quantum Mechanics and Objectivity.

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P.A.M. Peter A. Mackridge. *Lecturer in Modern Greek, University of Oxford. Author of The Modern Greek Language; Dionysios Solomos.*

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P.A.Ma. Phebe A. Marr. *Senior Fellow, National Defense University, Washington, D.C. Former Associate Professor of History, University of Tennessee, Knoxville. Author of The Modern History of Iraq.*

BAGHDAD (in part)

Pa.N. Paul Nash. *Professor of Philosophy and Education, Boston University. Author of Authority and Freedom in Education.*

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Pa.S. Pauline Simmons. *Associate Curator of Far Eastern Art, Metropolitan Museum of Art, New York City, 1928–58. Author of Chinese Patterned Silks.*

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INDIA (in part)

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NERVES AND NERVOUS SYSTEMS (in part)

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P.-B.L. Pierre-Bernard Lafont. *Director of Studies, Division of Historical and Philological Sciences, École Pratique des Hautes Études (Institute for Advanced Research), Paris. Author of Bibliographie du Laos and others.*

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P.B.M. Philip B. Meggs. *School of the Arts Research Professor, Virginia Commonwealth University, Richmond. Author of A History of Graphic Design; coeditor of Revival of the Fittest: Digital Versions of Classic Typefaces and others.*

GRAPHIC DESIGN

P.C. Pierre Camu. *Consultant. Professor of Economic Geography, Laval University, Quebec, 1956–60. President, St. Lawrence Seaway Authority, 1965–73. Author of Economic Geography of Canada.*
NORTH AMERICA (in part)

P.Ca. Pedro Calmon (d. 1985). *President, Brazilian Historical and Geographical Institute, Rio de Janeiro. Author of História do Brasil.*

CABRAL, PEDRO ÁLVARES (Micropædia)

P.C.A. Peter Christopher Alegi. *History Lecturer, Harvard University.*

SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

P.C.-B. Peter Cannon-Brookes. *Museum consultant. Keeper, Department of Art, National Museum of Wales, Cardiff, 1978–86. Author of Lombard Paintings; Czech Sculpture, 1800–1938; and others.*

ARCHITECTURE, THE HISTORY OF WESTERN (in part)

PAINTING, THE HISTORY OF WESTERN (in part)

SCULPTURE, THE HISTORY OF WESTERN (in part)

P.-C.C. Pao-Chi Chang. *Associate Professor of Architecture, Illinois Institute of Technology, Chicago. Partner, Alfred Swenson Pao-Chi Chang Architects, Chicago. Coauthor of Architectural Education at IIT, 1938–1978.*

BUILDING CONSTRUCTION (in part)

P.Ch. Pramod Chandra. *George P. Bickford Professor of Indian Art, Harvard University. Author of Stone Sculpture in the Allahabad Museum; Bundi Painting.*

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MUSIC, THE ART OF (in part)

P.-c.K. Ping-chia Kuo. *Emeritus Professor of History, Southern Illinois University, Carbondale. Senior Fellow, National Endowment for the Humanities, 1973–74. Author of China; China: New Age and New Outlook.*

CANTON (in part)

CHINA (in part)

CHUNGKING (in part)

NANKING (in part)

P.Cla. Peter Classen (deceased). *Professor of Medieval and Modern History, Rupert Charles University of Heidelberg, West Germany. Author of Karl der Grosse, das Papsttum und Byzanz.*

CHARLEMAGNE

P.Co. Pierre Courthion. *Vice President, Syndicate of the French Artistic Press, 1965–78. Author of Klee; Manet; Seurat; and many other monographs on modern European artists.*

MANET, ÉDOUARD (in part) (Micropædia)

SEURAT, GEORGES (Micropædia)

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LAMARCK, JEAN-BAPTISTE DE MONTE, CHEVALIER DE (Micropædia)

P.D. P. Dayal. *Professor and Head, Department of Geography, Patna University, India, 1951–75; 1978–82. Author of Bihar in Maps.*

INDIA (in part)

P.De. Pierre Descargues. *Art historian and critic. Author of Frans Hals; Jan Vermeer; and other monographs.*

HALS, FRANS (Micropædia)

VERMEER, JAN (Micropædia)

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PAINTING, THE ART OF

P.Dr. Philip Drucker (d. 1982). *Professor of Anthropology, University of Kentucky, Lexington, 1968–78. Author of The Native Brotherhoods: Modern Inter-Tribal Organizations of the Northwest Coast.*

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P.D.V. Paul D. Vignaux (d. 1987). *President, Section of Religious Sciences, École Pratique des Hautes Études (Institute for Advanced Research), Paris, 1961–72. Author of Philosophy in the Middle Ages: An Introduction.*

OCKHAM, WILLIAM OF (Micropædia)

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CONSERVATIVE PARTY (Micropædia)

LABOUR PARTY (Micropædia)

LIBERAL DEMOCRATIC PARTY (Micropædia)

LIBERAL PARTY (Micropædia)

POLITICAL SYSTEMS (in part) (Micropædia)

SOCIAL DEMOCRATIC PARTY (Micropædia)

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INDUSTRIES, MANUFACTURING (in part)

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Urkundenwesen im Dreizehnten Jahrhundert and others.

HISTORY, THE STUDY OF (in part)

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MAMMALS (in part)

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CANADA (in part)

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RELATIVITY

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DONNE, JOHN (Micropædia)

P.Gr. **Pier Groen** (d. 1995). *Professor of Meteorology and Physical Oceanography, Free University, Amsterdam. Author of The Waters of the Sea.*

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WESTERN (in part)

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BALKAN STATES (in part)

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BELLINI, GIOVANNI (Micropædia)

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FISHES (in part)

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P.Hu. **Peter J. Huizing** (d. 1995). *Professor of Canon Law and History of Canon Law, Catholic University of Nijmegen, The Netherlands. Author of The Sacraments in Theology and Canon Law.*

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Author of Die serbokroatischen Dialekte; coauthor of Accent in Serbocroatian.
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GIOTTO DI BONDONE (Micropædia)
PERUGINO (Micropædia)

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DUTCH LITERATURE (in part)

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MARKETING AND MERCHANDISING (in part)

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DOYLE, SIR ARTHUR CONAN (Micropædia)

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SUVOV, ALEKSANDR VASILYEVICH, GRAF (Micropædia)

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RENOIR, JEAN (Micropædia)

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P.L.Ge. Philip L. Gerber. *Professor of English, State University of New York College of Brockport. Author of Robert Frost and many others.*
FROST, ROBERT (Micropædia)

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ECONOMIC THEORY (in part)

P.Ma. Philip Mason. *Writer. Director, Institute of Race Relations, London, 1958–69. Indian Civil Service, 1928–47. Author of The Founders; The Guardians; The Birth of a Dilemma; The Men Who Ruled India; and many others.*
BENTINCK, LORD WILLIAM (Micropædia)

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Institute for Advanced Studies. Author of Celtic Mythology and others.
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FRENCH LITERATURE (in part)

P.McG.R. Peter McGregor Ross (d. 1974). *Professor of Engineering, University of Cambridge, 1970–74.*
ENGINEERING (in part)

P.McL. Peter McLintock (deceased). *Editor, Winnipeg Free Press, Manitoba.*
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EINSTEIN

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LITERATURE, THE ART OF (in part)

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CHARDIN, JEAN-BAPTISTE-SIMÉON (Micropædia)

P.M.Sy. Patrick Millington Syngé (d. 1982). *Editor, Publications of the Royal Horticultural Society, London, 1945–70. Author of Collins Guide to Bulbs; coauthor of The Dictionary of Garden Plants in Colour.*
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CONRAD II (GERMANY/HOLY ROMAN EMPIRE) (Micropædia)

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BETHE, HANS ALBRECHT (in part) (Micropædia)

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MORRIS, WILLIAM (Micropædia)

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BHUTAN

NEPAL (in part)

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ASIA (in part)

EUROPE (in part)

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EDUCATION, HISTORY OF (in part)

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Education, University of Southampton, England, 1980–87. Author of An Outline History of Medicine and others.

MEDICINE (in part)

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ETHICS

P.S.K. Pavel Sergeyevich Kuzin (d. 1976). *Senior Scientist, Leningrad Hydrological Institute. Author of Volga Zavtra.*

EUROPE (in part)

P.S.R. Philip S. Rawson (d. 1995). *Dean, School of Art and Design, Goldsmiths' College, London, 1981–84. Curator, Gulbenkian Museum of Oriental Art and Archaeology, University of Durham,*

England, 1960–79. *Author of The Arts of Southeast Asia and others.*

PAGAN (Micropædia)

SOUTHEAST ASIAN ARTS (in part)

P.S.W. Paul S. Wingert (d. 1974). *Professor of Art History and Archaeology, Columbia University. Author of Primitive Art, Its Traditions and Styles and others.*

MASKS

P.S.Wa. Piotr S. Wandycz. *Bradford Durfee Professor of History, Yale University. Author of The Lands of Partitioned Poland, 1795–1918 and many others.*

POLAND (in part)

P.T. Piero Treves (d. 1992). *Professor of Ancient History, University of Venice, Italy. Author of biography of Miltiades in Oxford Classical Dictionary.*

MILTIADES THE YOUNGER (Micropædia)

P.U. Philip Soundy Unwin (d. 1981). *Freelance editor. Senior Director, George Allen & Unwin Ltd., London. Author of Book Publishing as a Career.*

PUBLISHING (in part)

P.V. Paul Veyret (deceased). *Professor of Mountain Geography, University of Grenoble I, France. Coauthor of Au coeur de l'Europe: Les Alpes and others.*

EUROPE (in part)

P.V.G. Peteris V. Gulyans. *Professor, Institute of Economics, Latvian Academy of Sciences, Riga. Author of Latvia in the System of the U.S.S.R. National Economy.*

BALTIC STATES (in part)

P.Vi. Paul Viallaneix. *Emeritus Professor of French Literature, University of Clermont-Ferrand, France. Author of Vigny par lui-même and others; editor of Vigny's Oeuvres complètes.*

VIGNY, ALFRED-VICTOR, COMTE DE (in part) (Micropædia)

P.V.S. Paul Vincent Spade. *Professor of Philosophy, Indiana University, Bloomington. Author of Lies, Language and Logic in the Late Middle Ages and others.*

LOGIC, THE HISTORY AND KINDS OF (in part)

P.V.T. Phillip Vallentine Tobias. *Emeritus Professor of Anatomy and Human Biology, University of the Witwatersrand, Johannesburg. Author of Olduvai Gorge (vol. 2 and 4).*

EVOLUTION, HUMAN (in part)

P.W. Paul E. Walker. *Former Associate Professor of Islamic Studies, McGill University, Montreal.*

SALADIN (Micropædia)

P.Wa. Peggy Wagner. *Staff member, Houghton Mifflin Company, Boston. Editorial Assistant, Arts, Encyclopædia Britannica, Chicago, 1971–73.*

AFRICAN ARTS (in part)

P.W.A. Peter William Avery. *Former Lecturer in Persian, University of Cambridge; Fellow of King's College, Cambridge. Author of Modern Iran.*

IRAN (in part)

P.W.At. P.W. Atkins. *Fellow of Lincoln College, Oxford; Lecturer in Physical Chemistry, University of Oxford. Author of*

Molecular Quantum Mechanics and many others.

CHEMICAL BONDING

P.W.D. Paul W. Drake. *Professor of Political Science, University of California, San Diego, at La Jolla. Author of Socialism and Populism in Chile, 1932–52.*

CHILE (in part)

P.W.F. Peter W. Frank. *Emeritus Professor of Biology, University of Oregon, Eugene.*

GROWTH AND DEVELOPMENT, BIOLOGICAL (in part)

P.W.H. Paul W. Hodge. *Professor of Astronomy, University of Washington, Seattle. Author of Galaxies and others.*

GALAXIES

P.W.J. Pascual Jordan (d. 1980). *Professor of Theoretical Physics, University of Hamburg, 1953–70. Author of Verdrängung und Komplementarität: Eine philosophische Untersuchung.*

PHILOSOPHIES OF THE BRANCHES OF KNOWLEDGE (in part)

P.W.K. Peter W. Kingsford. *Tutor, Extra Mural Department, University of London. Author of Engineers, Inventors, and Workers; Victorian Railwaymen; and others.*

WATT, JAMES (Micropædia)

P.W.N. Peter W. Nathan. *Former External Scientific Worker of Medical Research Council, National Hospital for Nervous Diseases, London. Author of The Nervous System.*

NERVES AND NERVOUS SYSTEMS (in part)

P.Wo. Paul Wonnacott. *Alan R. Holmes Professor of Economics, Middlebury College, Vermont. Author of The United States and Canada: The Quest for Free Trade and others.*

INTERNATIONAL TRADE (in part)

P.Y. Philip Young (d. 1991). *Evan Pugh Professor of English, Pennsylvania State University, University Park, 1980–88. Author of Ernest Hemingway; coauthor of The Hemingway Manuscripts.*

HEMINGWAY, ERNEST (in part) (Micropædia)

P.Y.K. Pekka Yrjö Korkala. *Former Lecturer in Psychometrics, Institute of Psychology, University of Helsinki, Finland. Coauthor of Introduction to Psychometrics; coeditor of Contemporary Research in the Psychology of Perception.*

PERCEPTION, HUMAN (in part)

Q.Z. Quido Záruba (d. 1993). *Professor of Geology, Czech Technical University in Prague, 1946–71. Coauthor of Landslides and Their Control and others.*

GEOMORPHIC PROCESSES (in part)

R.A. Rosendo Arguello. *Former President, Academy of the Geography and History of Nicaragua, Managua. Author of Nueva Nicaragua.*

CENTRAL AMERICA (in part)

R.Aa. Richard I. Aaron (d. 1987). *Emeritus Professor of Philosophy, University College of Wales, Aberystwyth, University of Wales, 1932–69. Author of*

John Locke; Knowing and the Function of Reason.

LOCKE (in part)

R.A.An. Robert A. Andersen. *Director, Provasoli-Guillard National Center for Culture of Marine Phytoplankton, Bigelow Laboratory for Ocean Sciences, West Boothbay Harbor, Maine. Coeditor of Chrysophytes: Aspects and Problems.*

ALGAE

R.A.B. Roland A. Budenholzer. *Emeritus Professor of Mechanical Engineering; Emeritus Chairman, American Power Conference, Illinois Institute of Technology, Chicago.*

ENERGY CONVERSION (in part)

R.A.Bl. Robert Andrew Blust. *Professor of Linguistics, University of Hawaii at Manoa, Honolulu. Author of Austronesian Root Theory: An Essay on the Limits of Morphology.*

LANGUAGES OF THE WORLD (in part)

R.A.Bu. Robert Angus Buchanan. *Professor of the History of Technology; Director, Centre for the History of Technology, Science, and Society, University of Bath, England. Author of The Power of the Machine.*

TECHNOLOGY, THE HISTORY OF

R.A.Bx. Robert Alan Bix. *Professor of Mathematics, University of Michigan, Flint. Author of Conics and Cubics; Topics in Geometry.*

GEOMETRY (in part)

R.A.Co. Ralph A. Connor, D.D.S. *Professor of Pediatric and Community Dentistry, Dalhousie University, Halifax, Nova Scotia, 1971–72. Chief, Dental Health Division, Canadian Department of National Health and Welfare, Ottawa, 1963–71.*

MEDICINE (in part)

R.Ad. Ron Adams. *Professor of Social and Cultural Studies, Victoria University of Technology, Melbourne. Author of In the Land of Strangers: A Century of European Contact with Tanna, 1774–1874.*

PACIFIC ISLANDS (in part)

R.A.D. Richard A Davis, Jr. *Professor of Geology, University of South Florida, Tampa. Author of Depositional Systems and others.*

CONTINENTAL LANDFORMS (in part)

R.A.F. Richard Antony French. *Senior Lecturer in Geography, University College, 1972–94, and School of Slavonic and East European Studies, 1972–91, University of London. Author of The U.S.S.R. and Eastern Europe.*

BELARUS (in part)

KIEV (in part)

MOSCOW (in part)

SAINT PETERSBURG (in part)

R.A.G. Richard A. Geyer. *Emeritus Professor of Oceanography, Texas A&M University, College Station.*

ATLANTIC OCEAN, THE (in part)

R.A.Gi. Robert Andrew Gilbert. *Antiquarian bookseller. Author of The Golden Dawn: Twilight of the Magicians and others.*

OCCULTISM (in part)

- R.A.H.** Robert A. Hall, Jr. *Emeritus Professor of Linguistics and Italian, Cornell University, Ithaca, New York. Author of Pidgin and Creole Languages.*
LANGUAGES OF THE WORLD (in part)
- R.A.He.** Ronald A. Henson, M.D. (d. 1994). *Physician and Neurologist, London Hospital, 1949–81. Physician, National Hospital for Nervous Diseases, 1952–81.*
MUSCLES AND MUSCLE SYSTEMS (in part)
- R.A.Hi.** Reynold Alleyne Higgins (d. 1993). *Deputy Keeper of Greek and Roman Antiquities, British Museum, London, 1965–77. Author of Minoan and Mycenaean Art and others.*
PAINTING, THE HISTORY OF WESTERN (in part)
SCULPTURE, THE HISTORY OF WESTERN (in part)
- Ra.Ho.** Ralph Holmes. *Stage lighting designer. Senior Lighting Director, Columbia Broadcasting System, New York City.*
THEATRICAL PRODUCTION (in part)
- R.A.J.McD.** Robert A.J. McDonald. *Assistant Professor of History, University of British Columbia, Vancouver. Coeditor of Vancouver Past: Essays in Social History; British Columbia: Historical Readings.*
CANADA (in part)
- R.Ak.** Rais Akhtar. *Professor and Head, Department of Geography and Regional Development, University of Kashmir, Srinagar, India. Editor of Health Care Patterns and Planning in Developing Countries.*
INDIA (in part)
- R.A.K.** Raymond A. Kliphardt. *Emeritus Professor of Engineering Sciences, Northwestern University, Evanston, Illinois. Author of Program Design in Fortran IV.*
DRAFTING
- R.A.Ki.** Roger A. Kittleson. *Visiting Lecturer in History, Northwestern University, Evanston, Illinois. Author of Agents of Order: Pro-Abolition Elites and the Limits of Social Change in Brazil, 1880–1888.*
LATIN AMERICA, THE HISTORY OF (in part)
- R.A.Kl.** Robert A. Klocke, M.D. *Professor of Medicine and Physiology; Chief, Pulmonary Division, State University of New York at Buffalo. Coauthor of Normal and Abnormal Lung Function.*
RESPIRATION AND RESPIRATORY SYSTEMS (in part)
- R.Al.** Rex Alston (d. 1994). *Broadcaster and journalist. Staff Sports Commentator and Reporter, British Broadcasting Corporation, 1942–61. Cricket Reporter, Daily and Sunday Telegraph (London), 1961–88. Author of Watching Cricket and others.*
SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)
- R.A.La.** Ronald A. Laskey. *Charles Darwin Professor of Animal Embryology, University of Cambridge. Editor of Higher Order Structure in the Nucleus and others.*
CELLS (in part)
- R.A.M.** Robert A. Moog. *Designer of electronic musical instruments. President, Big Briar, Inc., Asheville, North Carolina.*
MUSICAL INSTRUMENTS (in part)
- R.A.Ma.** Richard A. Marston. *Professor of Geography and Recreation, University of Wyoming, Laramie. Editor of Wyoming Water Atlas and others.*
NORTH AMERICA (in part)
- R.A.Mu.** Robert A. Muller. *Professor of Geography and Anthropology; Director, Southern Regional Climate Center, Louisiana State University, Baton Rouge. Coauthor of Physical Geography Today.*
NORTH AMERICA (in part)
- Ra.N.** Ray Nash (d. 1982). *Professor of Art, Dartmouth College, Hanover, New Hampshire, 1949–70. Author of American Penmanship, 1800–1850; editor and translator of Calligraphy and Printing in the Sixteenth Century.*
WRITING (in part)
- R.A.N.** Robert A. Nisbet (d. 1996). *Albert Schweitzer Professor of Humanities, Columbia University, 1974–78. Noted for contributions to social theory and organization. Author of Social Change and History and others.*
SOCIAL SCIENCES, THE (in part)
- R.A.P.** Robert A. Pinker. *Professor of Social Administration, London School of Economics and Political Science, University of London. Author of The Idea of Welfare and others.*
SOCIAL WELFARE (in part)
- R.A.Pi.** Roger Alvin Pielke. *Professor of Atmospheric Science, Colorado State University, Ft. Collins. Author of Mesoscale Meteorological Modeling and others.*
EARTH SCIENCES, THE (in part)
- R.A.Pr.** Ralph Anthony Palmer. *Assistant Secretary, American Society of Agricultural Engineers, 1927–69.*
AGRICULTURAL SCIENCES (in part)
- R.A.R.** Richard A. Robison. *Gulf-Hedberg Professor of Geology, University of Kansas, Lawrence. Coauthor of Fossil Invertebrates.*
GEOCHRONOLOGY (in part)
- R.A.R.T.** Ronald A.R. Tricker (d. 1984). *Staff Inspector for Science, Ministry of Education, United Kingdom, 1946–62. Author of Bores, Breakers, Waves and Wakes and others.*
OCEANS (in part)
- R.Au.** Robert Austerlitz (d. 1994). *Professor of Linguistics and Uralic Studies, Columbia University, 1965–93. Coeditor of Readings in Linguistics I and II.*
LANGUAGES OF THE WORLD (in part)
- R.A.W.** Richard A. Watson. *Professor of Philosophy, Washington University, St. Louis, Missouri. Author of The Breakdown of Cartesian Metaphysics and others.*
CARTESIANISM, DESCARTES AND
- R.A.Wa.** Robert Austin Warner (d. 1986). *Professor of Music History and Musicology; Director, Stearns Collection of Musical Instruments, University of Michigan, Ann Arbor.*
MUSICAL INSTRUMENTS (in part)
- R.A.We.** Richard A. Webster. *Professor of History, University of California, Berkeley. Author of Industrial Imperialism in Italy, 1908–1915.*
EUROPEAN OVERSEAS EXPLORATION AND EMPIRES, THE HISTORY OF (in part)
- R.A.Wo.** Ralph A. Wooster. *Associate Vice President; Dean of Faculties, Lamar University, Beaumont, Texas. Author of Secession Conventions of the South and others.*
UNITED STATES OF AMERICA (in part)
- R.B.** Robert Browning (d. 1997). *Professor of Classics and Ancient History, Birkbeck College, University of London, 1965–81. Author of The Byzantine Empire and others.*
EDUCATION, HISTORY OF (in part)
GREEK LITERATURE (in part)
- R.Ba.** Ruth Barbour. *Lecturer in Greek Palaeography, University of Oxford, 1960–67.*
WRITING (in part)
- R.B.A.** Robert Brown Asprey. *Military historian and biographer. Author of War in the Shadows and others.*
WAR, THE THEORY AND CONDUCT OF (in part)
- R.B.C.** Raymond Brazenor Clayton. *Emeritus Professor of Biochemistry in Psychiatry, Stanford University, California. Editor of Steroids and Terpenoids.*
CHEMICAL COMPOUNDS (in part)
- R.B.D.** Robert Bruce Davidson. *Historical resources consultant. Former Curator of History, Provincial Museum of Alberta, Edmonton.*
CANADA (in part)
- R.B.G.** Richard B. Goode. *Director, Fiscal Affairs Department, International Monetary Fund, Washington, D.C., 1965–81. Author of The Corporation Income Tax.*
TAXATION (in part)
- R.Bl.** Raymond Bloch. *Professor, École Pratique des Hautes Études (Institute for Advanced Research), Paris. Author of The Etruscans; The Origins of Rome.*
ARCHITECTURE, THE HISTORY OF WESTERN (in part)
PAINTING, THE HISTORY OF WESTERN (in part)
SCULPTURE, THE HISTORY OF WESTERN (in part)
- R.B.L.** R. Bruce Lindsay (d. 1985). *Hazard Professor of Physics, Brown University, Providence, Rhode Island, 1936–71. Editor in Chief, Acoustical Society of America. Author of Lord Rayleigh: The Man and His Work.*
RAYLEIGH, JOHN WILLIAM STRUTT, 3RD
BARON (Micropædia)
- R.B.M.** Raj B. Mathur. *Director, Environmental Sciences, Tetra Tech, Inc., San Bernardino, California. Coauthor of A Historical Atlas of South Asia.*
INDIA (in part)
- R.B.Ni.** Robert Brayton Nichols. *Landscape architect.*
PARK (Micropædia)

R.Br. **Reginald Brill.** *Freelance writer and historian. Author of Terror of the French: John, Lord Talbot, c. 1388–1453 and several articles on the period of the Hundred Years' War.*

RICHEMONT, ARTHUR, CONSTABLE DE (Micropædia)

R.B.S. **Richard B. Sewall.** *Emeritus Professor of English, Yale University. Author of The Vision of Tragedy; coeditor of Tragedy: Modern Essays in Criticism. LITERATURE, THE ART OF (in part)*

R.B.Se. **Robert Bertram Serjeant** (d. 1993). *Sir Thomas Adams's Professor of Arabic, University of Cambridge, 1970–82; Director, Middle East Centre, 1965–82. Author of The Portuguese off the South Arabian Coast and others. ARABIA (in part)*

R.B.W. **Richard B. Wolin.** *Distinguished Professor of History, Graduate Center, City University of New York. Author of The Terms of Cultural Criticism: The Frankfurt School, Existentialism, Poststructuralism and others. HEIDEGGER, MARTIN (in part) (Micropædia) PHILOSOPHY, THE HISTORY OF WESTERN (in part)*

R.C. **René Coste.** *President, French Institute of Coffee and Cocoa, Paris; General Director, 1958–78. Author of Les Caféiers et les cafés dans le monde. BEVERAGE PRODUCTION (in part)*

R.Ca. **Sir Raymond Carr.** *Warden of St. Antony's College, University of Oxford, 1968–87. Author of Spain, 1808–1939 and others. SPAIN (in part)*

R.C.At. **Ralph Charles Atkins.** *Staff reporter, Financial Times, London. UNITED KINGDOM (in part)*

R.C.B. **Robert C. Bailey.** *Professor of Anthropology, University of California, Los Angeles. AFRICA (in part)*

R.C.Bi. **R.C. Bigalke.** *Professor of Nature Conservation, University of Stellenbosch, South Africa. Coauthor of The Evolution of Mammals on the Southern Continents. MAMMALS (in part)*

R.C.Bo. **Raj C. Bose** (deceased). *Professor of Mathematics and Statistics, Colorado State University, Fort Collins, 1971–80. Coeditor of Proceedings of the Conference on Combinatorial Mathematics and Its Applications. COMBINATORICS AND COMBINATORIAL GEOMETRY (in part)*

R.C.Br. **Robert C. Brasted** (d. 1986). *Professor of Chemistry, University of Minnesota, Minneapolis. Coauthor and editor of Comprehensive Inorganic Chemistry (8 vol.). CHEMICAL ELEMENTS (in part)*

R.C.Bu. **Robin Caron Buss.** *Writer and translator. Author of The French Through Their Films; French Film Noir. FRENCH LITERATURE (in part) MARSEILLE (in part)*

R.C.C. **Ralph C. Croizier.** *Professor of History, University of Victoria, British*

Columbia. Author of Traditional Medicine in Modern China.

CHENG CH'ENG-KUNG (Micropædia)

R.Ce. **Roberto Cessi** (d. 1969). *Professor of History, University of Padua, Italy, 1922–60. Deputy in the Italian Parliament, 1948–53.*

VENICE (in part)

R.C.E. **Robert C. Elliott** (d. 1981). *Professor of English Literature, University of California, San Diego, at La Jolla, 1964–81. Author of The Power of Satire; The Shape of Utopia.*

LITERATURE, THE ART OF (in part)

R.C.Ei. **Robert C. Eidt** (d. 1987). *Professor of Geography, University of Wisconsin, Milwaukee, 1967–87; Director, State Soils Laboratory, 1981–87. Author of Pioneer Settlement in Northeast Argentina. ARGENTINA (in part)*

R.C.F. **Richard Charles Froeschner.** *Curator, Hemiptera Section, Department of Entomology, Smithsonian Institution, Washington, D.C.*

INSECTS (in part)

R.Ch. **R. Champakalakshmi.** *Professor of Ancient Indian History, Jawaharlal Nehru University, New Delhi. Author of Vaisnava Iconography in the Tamil Country. INDIA (in part)*

R.C.Ke. **Richard C. Keating.** *Botanist, Missouri Botanical Garden, St. Louis. Cotranslator and coeditor of Meiland: A Life in Roses.*

ANGIOSPERMS (in part)

R.C.Ki. **Robert C. Kiste.** *Director and Professor, Center for Pacific Islands Studies, University of Hawaii at Manoa, Honolulu. Author of The Bikinians: A Study in Forced Migration. PACIFIC ISLANDS (in part)*

R.C.L. **Richard C. Latham.** *Former coauthor of United States Polo Association Annual.*

POLO (in part) (Micropædia)

R.C.N. **Robert C. North.** *Emeritus Professor of Political Science, Stanford University, California. Author of Moscow and Chinese Communists and others. LIU SHAOQI (Micropædia)*

R.Co. **Robert Cornevin** (d. 1988). *Permanent Secretary, Academy of Overseas Sciences, Paris. Head, Centre of Studies and Documentation on Africa and Overseas, Paris. Author of Histoire de l'Afrique and others.*

WEST INDIES, THE (in part)

R.Cog. **Raymond Cogniat** (d. 1977). *Principal Inspector of Fine Arts, 1943–67. Head of the arts section, Le Figaro, Paris, 1957–77. Author of Renoir and other works on 20th-century artists of the school of Paris.*

RENOIR, PIERRE-AUGUSTE (Micropædia)

R.C.R. **Reed C. Rollins.** *Asa Gray Professor Emeritus of Systematic Botany, Harvard University; Director, Gray Herbarium, 1948–78. Author of The Cruciferae of Continental North America and others.*

UNITED STATES OF AMERICA (in part)

R.C.Sm. **Robert C. Smith** (d. 1975). *Professor of the History of Art, University of Pennsylvania, Philadelphia, 1956–75. Author of The Art of Portugal and others.*

DECORATIVE ARTS AND FURNISHINGS (in part)

R.C.Su. **Robert Carl Suggs.** *Anthropologist. Conductor of anthropological and archaeological field research in Polynesia, 1956–58. Author of Island Civilizations of Polynesia; The Hidden Worlds of Polynesia; and others. PACIFIC ISLANDS (in part)*

R.C.-W. **Rupert Crawshaw-Williams** (d. 1977). *Author of Russell Remembered; Methods and Criteria of Reasoning. RUSSELL, BERTRAND (Micropædia)*

R.C.Y. **Richard Charles York.** *Instructor of Horticulture and Education, McHenry County College, Crystal Lake, Illinois, Former Associate Editor, Biology, Encyclopædia Britannica, Chicago. PHILOSOPHIES OF THE BRANCHES OF KNOWLEDGE (in part)*

R.D. **Robert Dorfman.** *Emeritus Professor of Economics, Harvard University. Author of The Price System. ECONOMIC THEORY (in part)*

R.Da. **René David.** *Professor of Comparative Law, University of Aix-Marseille III, Aix-en-Provence, France, 1970–76. Author of Les Grands Systèmes de droit contemporains. SOCIAL SCIENCES, THE (in part)*

R.D.B. **Richard David Barnett** (d. 1986). *Keeper, Department of Western Asiatic Antiquities, British Museum, London, 1955–74. LEBANON (in part)*

R.D.Ba. **Robert D. Barnes** (d. 1993). *Professor of Biology, Gettysburg College, Pennsylvania, 1963–93. Author of Invertebrate Zoology. ARTHROPODS*

R.D.Br. **Robert Denton Braun.** *Professor of Chemistry, University of Southwestern Louisiana, Lafayette. Author of Introduction to Chemical Analysis and others. ANALYSIS AND MEASUREMENT, PHYSICAL AND CHEMICAL (in part)*

R.D.C. **Rosalind D. Cartwright.** *Chairman, Department of Psychology; Director, Sleep Disorder Service, Rush-Presbyterian St. Luke's Medical Center, Chicago. Author of Crisis Dreaming and others. SLEEP AND DREAMS (in part)*

R.D.D.G. **Robert Donald Davidson Gibson.** *Emeritus Professor of French, University of Kent at Canterbury, England. Author of Modern French Poets on Poetry. VALÉRY, PAUL (Micropædia)*

R.D.E.B. **Richard D.E. Burton.** *Reader in French, University of Sussex, Brighton, England. Author of Baudelaire and the Second Republic: Writing and Revolution and many others. BAUDELAIRE, CHARLES (Micropædia)*

R.D.F. **Ralph D. Feigin, M.D. J.S.** *Abercrombie Professor and Chairman,*

Department of Pediatrics, Baylor College of Medicine, Houston. Physician-in-Chief, Texas Children's Hospital. Coeditor and coauthor of Textbook of Pediatric Infectious Diseases.

INFECTIOUS DISEASES (in part)

R.D.Fo. Raymond D. Fogelson. *Professor of Anthropology, University of Chicago. Editor of Handbook of North American Indians, vol. 14, Southeast.*

AMERICAN PEOPLES, NATIVE (in part)

R.D.H. Robert D. Herman. *Professor of Sociology, Pomona College, Claremont, California. Author of Gamblers and Gambling.*

LOTTERY (Micropædia)

R.D.M. Robert Douthat Meade (d. 1974). *Professor of History, Randolph-Macon Woman's College, Lynchburg, Virginia, 1939–71. Author of Patrick Henry, Patriot in the Making.*

HENRY, PATRICK (Micropædia)

R.D.Mi. Robin David Middleton. *Professor of Art History and Archaeology, Columbia University.*

ARCHITECTURE, THE HISTORY OF WESTERN (in part)

R.Do. Ron Dorfman. *Director of Publications, Field Museum of Natural History, Chicago.*

CHICAGO (in part)

R.Du. Raymond E. Durnat. *Visiting Professor, University of East London, England. Author of Films and Feelings and others.*

GODARD, JEAN-LUC (Micropædia)

RESNAIS, ALAIN (in part) (Micropædia)

TRUFFAUT, FRANÇOIS (in part) (Micropædia)

R.Dum. René Dumesnil (d. 1967). *Literary and music critic. Member, Academy of Fine Arts, Institute of France, 1965–67. Author of Gustave Flaubert, l'homme et l'oeuvre; Guy de Maupassant; and others.*

FLAUBERT, GUSTAVE (in part) (Micropædia)

MAUPASSANT, GUY DE (in part)

(Micropædia)

R.D.W. Robert Deryck Williams (d. 1986). *Professor of Classics, University of Reading, England. Author of Virgil; editor of Aeneid.*

VIRGIL (in part)

R.D.Wa. Robert Donald Walker. *Training Manager, Allied Steel and Wire, Cardiff, Wales. Author of Modern Ironmaking Methods and others.*

INDUSTRIES, EXTRACTION AND PROCESSING (in part)

R.E.B. Richard E. Berg. *Supervisor, Teaching Support Services; Director, Lecture-Demonstration Facility, Department of Physics, University of Maryland, College Park. Coauthor of The Physics of Sound.*

SOUND

R.E.Bn. Ray E. Brown (d. 1974). *Professor of Administration and Executive Vice President, Northwestern University Medical Center, Chicago, 1970–74.*

MEDICINE (in part)

R.E.C. Roy Eugene Cameron. *Environmental Adviser, Department of Natural Resource Protection, Mashantucket Pequot Tribe, Connecticut. Former Senior Staff Scientist, Office of Environmental Programs, Lockheed Engineering & Sciences Company, Las Vegas, Nevada.*

NORTH AMERICA (in part)

R.E.Co. Robert E. Conot. *Editor, Los Angeles Times. Senior Lecturer in Journalism, University of Southern California, Los Angeles. Author of A Streak of Luck: The Life and Legend of Thomas Alva Edison and others.*

EDISON (in part)

R.E.Cr. Raymond E. Crist (d. 1993). *Research Professor of Geography, University of Florida, Gainesville, 1951–75. Author of The Cauca Valley, Colombia.*

SOUTH AMERICA (in part)

WEST INDIES, THE (in part)

R.E.D. The Rev. Rupert E. Davies (d. 1994). *Principal, Wesley College, Bristol, England, 1967–73. President, Methodist Conference, 1970–71. Author of Methodism; coeditor of The History of the Methodist Church in Great Britain.*

PROTESTANTISM (in part)

R.E.Da. Robert E. Davies (d. 1993). *Benjamin Franklin Professor of Molecular Biology; University Professor, School of Veterinary Medicine, University of Pennsylvania, Philadelphia, 1977–90.*

MUSCLES AND MUSCLE SYSTEMS (in part)

R.E.E. Ronald Eric Emmerick. *Professor and Director, Department of Iranian Studies, University of Hamburg, Germany. Author of Saka Grammatical Studies; editor and translator of several Khotanese works.*

LANGUAGES OF THE WORLD (in part)

R.E.F. Ralph E. Fuhrman. *Consultant, Black & Veatch, consulting engineers, Washington, D.C. Special Assistant to the Director, Municipal Wastewater Systems Division, Environmental Protection Agency, 1972–73.*

PUBLIC WORKS (in part)

R.E.Fi. Raymond E. Fielding. *Dean, School of Motion Picture, Television and Recording Arts, Florida State University, Tallahassee. Editor of A Technological History of Motion Pictures and Television.*

DE FOREST, LEE (Micropædia)

Re.G. Renu Garg, M.D. *Pediatrician.*

INFECTIOUS DISEASES (in part)

R.E.G. Ralph E. Grim (d. 1989). *Research Professor of Geology, University of Illinois at Urbana-Champaign, 1948–67. Scholar whose outstanding synthesis of clay mineralogy served as a guide for a generation of research scientists. Author of Clay Mineralogy and others.*

MINERALS AND ROCKS (in part)

R.E.Ga. Rosemary Elizabeth Galli. *Rural development adviser, Institute for Rural Development, Maputo, Mozambique. Coauthor of Guinea Bissau.*

WESTERN AFRICA (in part)

R.E.Gi. Reginald E. Gillmor (d. 1960). *Vice President, Sperry Gyroscope*

Company, Inc., Brooklyn, New York, 1932–45.

NAVIGATION (in part)

Re.H. Reinhold D. Hohl. *Art historian. Author of Giacometti and others.*

GIACOMETTI, ALBERTO (Micropædia)

R.E.H. Richard Eric Holtum (d. 1990). *Honorary Research Associate, Royal Botanic Gardens, Kew, England. Director, Botanic Gardens, Singapore, 1925–49. Professor of Botany, University of Malaya, Singapore, 1949–54. Author of A Revised Flora of Malaya and others.*

ANGIOSPERMS (in part)

R.E.Hu. Robert E. Huke. *Emeritus Professor of Geography, Dartmouth College, Hanover, New Hampshire. Coauthor of Human Geography of Rice in South Asia and others.*

INDIA (in part)

R.E.K. Rudolf E. Kalman. *Professor of Mathematical System Theory, Swiss Federal Institute of Technology, Zürich. Graduate Research Professor of Mathematics; Director, Center for Mathematical System Theory, University of Florida, Gainesville, 1971–95. Coauthor of Topics in Mathematical System Theory.*

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R.E.Ka. Robert E. Kahn. *Chairman, CEO, and President of the Corporation for National Research Initiatives.*

INTERNET (Micropædia)

Re.L. René Lemarchand. *Emeritus Professor of Political Science, University of Florida, Gainesville. Author of Rwanda and Burundi and others.*

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R.E.L.F. Robert E.L. Faris (deceased). *Professor of Sociology, University of Washington, Seattle, 1948–73. Editor of Handbook of Modern Sociology.*

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R.E.M. Roger Eric Marchant. *Associate Professor of Biomedical Engineering and Macromolecular Science, Case Western Reserve University, Cleveland, Ohio.*

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PROTESTANTISM (in part)

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Re.P. Rebecca Posner. *Professor of Romance Languages, University of Oxford. Author of The Romance Languages: A Linguistic Introduction and others; editor of Trends in Romance Linguistics and Philology (5 vol.).*

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DIAGNOSIS AND THERAPEUTICS

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THERMODYNAMICS, PRINCIPLES OF (in part)

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R.F.D. **Raymond F. Dasmann.** *Emeritus Professor of Ecology, University of California, Santa Cruz. Author of Environmental Conservation.*

CONSERVATION OF NATURAL RESOURCES

R.F.G.A. **R.F.G. Alford.** *Senior Research Associate, Financial Markets Group, London School of Economics and Political Science, University of London; former Cassel Reader in Economics.*

MARKETS (in part)

R.F.H. **Sir Roy Forbes Harrod** (d. 1978). *Nuffield Reader in Economics, University*

of Oxford, 1952–67. Author of International Economics and others.

INTERNATIONAL TRADE (in part)

R.F.-He. **Regina Flannery-Herzfeld.** *Emeritus Professor of Anthropology, Catholic University of America, Washington, D.C. Author of The Gros Ventre of Montana, Part I, Social Life.*

AMERICAN PEOPLES, NATIVE (in part)

R.F.Hi. **Ronald Francis Hingley.** *Fellow of St. Antony's College, Oxford; Lecturer in Russian, University of Oxford. Author of Chekhov: A Biographical and Critical Study; Russian Writers and Society; Nihilists; and others; editor and translator of The Oxford Chekhov.*

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GORKY, MAKSIM (in part) (Micropædia)

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R.Fi. **Ross Fitzgerald.** *Associate Professor of History and Politics, Griffith University, Brisbane, Australia. Author of A History of Queensland (2 vol.).*

AUSTRALIA (in part)

R.Fl. **Ronald Fletcher** (d. 1992). *Professor of Sociology, University of Reading, England, 1979–82. Author of Auguste Comte and the Making of Sociology and others.*

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R.F.Lo. **Richard F. Logan** (d. 1994). *Professor of Geography, University of California, Los Angeles. Author of The Central Namib Desert.*

AFRICA (in part)

R.-F.-M.A. **Roger-François-Marie Aubert.** *Emeritus Professor of Church History, Catholic University of Louvain, Belgium. Author of Le Pontificat de Pie IX and others.*

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R.Fo. **Robert Folkenflik.** *Professor of English, University of California, Irvine. Author of Samuel Johnson, Biographer.*

JOHNSON, SAMUEL

R.F.P. **Richard F. Peterson.** *Professor of English, Southern Illinois University at Carbondale. Editor, Southern Illinois University Press Writing Baseball Series. Author of Extra Innings: Writing on Baseball.*

BASEBALL (in part)

R.F.Pe. **Ronald Francis Peel** (d. 1985). *Professor of Geography, University of Bristol, England, 1957–77. Chairman, Commission on Arid Lands, International Geographical Union. Author of Physical Geography.*

AFRICA (in part)

R.F.S. **Robert F. Siliciano.** *Professor of Medicine, Johns Hopkins University, Baltimore, Maryland.*

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R.F.T. **René Frédéric Thom.** *Mathematician and philosopher, Institut des Hautes Études Scientifiques (Institute of Advanced Scientific Research), Bures-sur-Yvette, France. Author of Stabilité structurelle et morphogénèse.*

TOPOLOGY (in part)

R.F.Tr. **Reginald Francis Treharne** (d. 1967). *Professor of History, University College of Wales, Aberystwyth, University of Wales, 1930–67. Author of The Baronial Plan of Reform, 1258–1263 and others.*

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INFORMATION THEORY

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Author of The Making of the Georgian Nation and others.

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R.H.B. **Roland H. Bainton** (d. 1984). *Titus Street Professor of Church History, Yale University, 1936–62. Author of The Reformation of the Sixteenth Century and others.*
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TOPOLOGY (in part)

R.H.By. **Robert Howard Byrne.** *Distinguished Research Professor of Marine Science, University of South Florida at St. Petersburg.*
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R.H.Fr. **Richard H. Freeborn.** *Emeritus Professor of Russian Literature, School of Slavonic and East European Studies, University of London. Author of Turgenev, a Study and others.*
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R.H.Fu. **Robert H. Fuson.** *Emeritus Professor of Geography, University of South Florida, Tampa. Author of Fundamental Place-Name Geography and others.*
UNITED STATES OF AMERICA (in part)

R.H.G. **Richard Harold Greenwood.** *Professor of Geography, University College of Swansea, University of Wales, 1970–80. Professor of Geography, University of Queensland, Brisbane, Australia, 1958–70.*
AUSTRALIA (in part)

R.H.Gr. **Reginald Herbold Green.** *Fellow, Institute of Development Studies, Professorial Fellow, University of Sussex, Falmer, England. Senior Social Policy Advisor, Mozambique National Planning*

Commission. Coauthor and editor of Namibia: The Last Colony.
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DEL VALLE DE OAXACA (in part)
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R.H.J. **Richard H. Jahns** (d. 1983). *Crook Professor of Geology and Applied Earth Sciences, Stanford University, California; Dean, School of Earth Sciences, 1965–79. Editor and coauthor of Geology of Southern California.*
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R.H.Kl. **Ronald H. Kluger.** *Professor of Chemistry, University of Toronto.*
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R.H.P. **Richard H. Popkin.** *Emeritus Professor of Philosophy, Washington University, St. Louis, Missouri. Adjunct Professor of History and Philosophy, University of California, Los Angeles. Author of History of Scepticism from Erasmus to Spinoza.*
PHILOSOPHICAL SCHOOLS AND DOCTRINES,
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R.H.Po. **René Henry Pomeau.** *Former Professor of French Literature, University of Paris IV. Author of La Religion de Voltaire and others.*
VOLTAIRE

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WRITING (in part)

R.H.S. **Roger Henry Simpson.** *Historian and lecturer.*
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(Micropædia)

R.H.Sc. **Robert H. Schmidt, Jr.** *Professor of Geological Sciences, University of Texas at El Paso. Author of various papers on the geography and climate of Mexico.*
NORTH AMERICA (in part)

R.H.St. **Roger H. Stuewer.** *Professor of the History of Science and Technology, University of Minnesota, Minneapolis. Author of The Compton Effect: Turning Point in Physics.*
PLANCK

R.H.T. **Ralph H. Turner.** *Emeritus Professor of Sociology, University of California, Los Angeles. Coauthor of Collective Behavior.*
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R.H.Tu. **Russell Howard Tuttle.** *Professor of Anthropology, University of Chicago. Author of Apes of the World: Their Social Behavior, Communication, Mentality and Ecology.*
BIOLOGICAL SCIENCES, THE (in part)

R.Hu. **René Huyghe.** *Professor of Art, Collège de France, Paris, 1950–76. President, Council of Museums, Paris, 1974–88. Author of Cézanne; Delacroix ou le combat solitaire; and others.*
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Ri.H. **Richard Hamilton Hobson.** *Former public relations officer in Lusaka, Zambia.*
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Ri.J.H. **Richard J. Hathaway.** *Consultant on Michigan history and literature. Editor of Michigan: Visions of Our Past; Literary Michigan: A Sense of Place, A Sense of Time.*
UNITED STATES OF AMERICA (in part)

Ri.J.Ha. **Richard John Harrison.** *Reader in Archaeology, University of Bristol, England. Author of Spain at the Dawn of History and others.*
SPAIN (in part)

Ri.L. **Richard Lane.** *Research Associate, Honolulu Academy of Arts. Author of Masters of the Japanese Print; Hokusai: Life and Work; and others.*
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Ri.L.C. **Richard L. Chambers.** *Associate Professor of Near Eastern Languages and Civilizations, University of Chicago. Coeditor of and contributor to Beginnings of Modernization in the Middle East.*
IRAQ (in part)

Ri.M.L. **Richard M. Lerner.** *Professor of Family and Child Ecology and of Psychology; Director, Institute for Children, Youth, and Families, Michigan State University, East Lansing. Author of Concepts and Theories of Human Development and others.*
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Ri.P. **Richard Pittioni** (d. 1985). *Professor of Prehistory and Protohistory, University of Vienna. Author of Ergebnisse und Probleme des urzeitlichen Metallhandels and others.*
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R.I.S. **Robert I. Scace.** *Director, Microelectronics Programs, National*

Institute of Standards and Technology, Gaithersburg, Maryland.

ELECTRONICS (in part)

Ri.Ta. **Richard Taruskin.** *Professor of Musicology, University of California, Berkeley. Author of Stravinsky and the Russian Traditions; Defining Russia Musically: Historical and Hermeneutical Essays.*

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Ri.W.S. **Richard Walton Stephens.** *Professor of Sociology, George Washington University, Washington, D.C. Coauthor of Power, Presidents, and Professors.*

WASHINGTON, D.C. (in part)

R.J. **Raymond Jeanloz.** *Professor of Geology and Geophysics, University of California, Berkeley.*

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R.J.A. **Richard J. Andrew.** *Professor of Animal Behaviour, University of Sussex, Brighton, England. Author of numerous papers on behaviour of birds and primates.*

BEHAVIOUR, ANIMAL (in part)

R.J.Al. **Robert J. Alexander.** *Emeritus Professor of Economics and Political Science, Rutgers University, New Brunswick, New Jersey. Author of Prophets of the Revolution: Profiles of Latin American Political Leaders.*

CÁRDENAS, LÁZARO (Micropædia)

R.J.B. **Robert John Behnke.** *Fisheries consultant. Professor of Fishery Biology, Colorado State University, Fort Collins.*

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R.J.Br. **Robert J. Braidwood.** *Emeritus Professor of Old World Prehistory, Oriental Institute, University of Chicago. Author of Prehistoric Men and others.*

PREHISTORIC PEOPLES AND CULTURES (in part)

R.J.C. **Richard J. Crampton.** *Lecturer in East European History, University of Oxford; Fellow of St. Edmund Hall, Oxford. Author of Eastern Europe in the Twentieth Century and others.*

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R.J.Ch. **Robert Jesse Charleston** (d. 1994). *Keeper, Department of Ceramics, Victoria and Albert Museum, London, 1963–76. Author of Masterpieces of Glass and others.*

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R.J.F. **Robert J. Fernier** (d. 1977). *President, The Friends of Gustave Courbet, Paris. Author of Gustave Courbet, peintre de l'art vivant.*

COURBET, GUSTAVE (Micropædia)

R.J.G. **Richard Johnson Goss.** *Robert P. Brown Professor of Biology, Brown University, Providence, Rhode Island. Author of Principles of Regeneration.*

GROWTH AND DEVELOPMENT, BIOLOGICAL (in part)

R.J.H. **Robert J. Havighurst** (d. 1991). *Professor of Education and of Human Development, University of Chicago, 1941–65. Specialist on the social*

psychology of education and human development. Author of Comparative Perspectives on Education and others.

TEACHING (in part)

R.J.Ha. **Sir Richard J. Harrison, M.D.** *Emeritus Professor of Anatomy, University of Cambridge. Author of Reproduction and Man and others.*

REPRODUCTION AND REPRODUCTIVE SYSTEMS (in part)

R.J.H.-C. **Ronald James Harrison-Church.** *Emeritus Professor of Geography, London School of Economics and Political Science, University of London. Author of West Africa.*

AFRICA (in part)

WESTERN AFRICA (in part)

R.J.Hi. **Roland John Hill.** *Former London Correspondent, Die Presse (Vienna) and Stuttgarter Zeitung, Stuttgart, West Germany.*

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R.J.J. **Roland John Jackson.** *Emeritus Professor of Music, Claremont Graduate School, California. Editor of Neapolitan Keyboard Composers c. 1600.*

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R.J.K. **Robert J. Kadner.** *Professor of Microbiology, University of Virginia, Charlottesville. Coauthor of Essentials of Medical Microbiology.*

BACTERIA AND OTHER MONERANS

R.J.M. **Ronald James Morley.** *Former Technical Director, Coal Products Division, National Coal Board, Harrow, England.*

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R.J.Ma. **Richard J. Mayne.** *Former Coeditor, Encounter. Author of The Recovery of Europe; Postwar: The Dawn of Today's Europe.*

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R.J.Me. **Robert James Menzies** (d. 1976). *Professor of Oceanography, Florida State University, Tallahassee, 1967–76. Panel Chairman in Marine Biology, Gulf University Research Corporation.*

ATLANTIC OCEAN, THE (in part)

R.J.Mi. **Romuald J. Misiunas.** *Ambassador of Lithuania to Israel. Coauthor of The Baltic States: Years of Dependence, 1940–1990.*

BALTIC STATES (in part)

R.J.N. **Robert J. Nelson.** *Professor of French, University of Illinois at Urbana-Champaign. Author of Corneille: His Heroes and Their Worlds.*

CORNEILLE, PIERRE (Micropædia)

R.J.Ne. **R.J. Nelson** (d. 1997). *Truman P. Handy Professor of Philosophy, Case Western Reserve University, Cleveland, Ohio, 1972–81. Author of Introduction to Automata.*

AUTOMATA THEORY (in part)

R.J.No. **Robert J. Norrell.** *Professor of History, University of Alabama, Tuscaloosa. Author of Reaping the Whirlwind: The Civil Rights Movement in Tuskegee.*

UNITED STATES OF AMERICA (in part)

R.Jo. **Robert Joynt.** *Professor of Neurology, Neurobiology, and Anatomy, University of Rochester, New York.*

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R.J.Q. **Ricardo J. Quinones.** *Professor of English and Comparative Literature; Director, Gould Center for Humanistic Studies, Claremont McKenna College, California. Author of Dante Alighieri.*

DANTE

R.J.S. **R.J. Stephenson** (d. 1973). *William F. Harn Professor of Physics, College of Wooster, Ohio, 1959–71.*

NAVIGATION (in part)

R.J.Sc. **Randall John Schaetzel.** *Associate Professor of Geography, Michigan State University, East Lansing.*

NORTH AMERICA (in part)

R.J.Sm. **Ralph J. Smith.** *Emeritus Professor of Electrical Engineering, Stanford University, California. Author of Engineering as a Career.*

ENGINEERING (in part)

R.J.St. **Robert J. Sternberg.** *IBM Professor of Psychology and Education, Yale University. Author of Intelligence Applied and others.*

INTELLIGENCE, HUMAN

R.J.T. **Roger John Tayler** (d. 1997). *Professor of Astronomy, University of Sussex, Brighton, England, 1967–95. Author of The Origin of the Chemical Elements and others.*

CHEMICAL ELEMENTS (in part)

R.J.Ta. **Robert J. Tata.** *Professor of Geography, Florida Atlantic University, Boca Raton. Author of Structural Changes in Puerto Rico's Economy, 1947–1976.*

WEST INDIES, THE (in part)

R.J.Z. **Roman J. Zorn.** *Emeritus Professor of American History, University of Nevada, Las Vegas. Author of numerous articles on U.S. history and political science.*

UNITED STATES OF AMERICA (in part)

R.J.Z.W. **R.J. Zwi Werblowsky.** *Emeritus Professor of Comparative Religion, Hebrew University of Jerusalem. Author of Joseph Karo, Lawyer and Mystic and others.*

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R.K. **Rudolf Kingslake.** *Emeritus Professor of Optics, University of Rochester. Director of Optical Design, Eastman Kodak Company, Rochester, New York, 1939–69. Author of Optical System Design and others; editor of Applied Optics and Optical Engineering.*

OPTICS, PRINCIPLES OF (in part)

R.K.A.G. **Robert K.A. Gardiner.** *Commissioner for Economic Planning, Ghana, 1975–78. Executive Secretary, United Nations Economic Commission for Africa, Addis Ababa, Ethiopia, 1962–75. Author of A World of Peoples.*

AFRICA (in part)

R.Ki. **Ralph Kirkpatrick** (d. 1984). *Harpsichordist. Professor of Music, Yale University, 1965–76. Author of Domenico Scarlatti and others.*

SCARLATTI, DOMENICO (in part)
(Micropædia)

R.K.K. Raymond K. Kent. *Professor of History, University of California, Berkeley. Author of Early Kingdoms in Madagascar, 1500–1700 and many others.*
MADAGASCAR (in part)

R.K.L. Robert K. Lane. *Regional Director, Western and Northern Region, Environmental Protection Service, Environment Canada, Edmonton, Alberta. Head, Physical Limnology Section, Canada Centre for Inland Water, Burlington, Ontario, 1967–72.*
LAKES (in part)

R.K.M. Ronald K. Murton (d. 1978). *Senior Principal Scientific Officer, Institute of Terrestrial Ecology, Monks Wood Experimental Station, Huntingdon, England. Researcher on the population dynamics and behaviour of pigeons and doves. Author of The Woodpigeon.*
BIRDS (in part)

R.K.Mo. Robert K. Morrow, Jr. *Consultant in digital communications and computer networking. Former deputy head, Department of Electrical and Computer Engineering, Air Force Institute of Technology, Wright-Patterson Air Force Base, Dayton, Ohio. Author of numerous papers on radio and computer technology.*
TELECOMMUNICATIONS SYSTEMS (in part)

R.Kr. Richard Kroner (d. 1974). *Professor of the Philosophy of Religion, Union Theological Seminary, New York City, 1941–55. Author of Von Kant bis Hegel.*
FICHTE, JOHANN GOTTLIEB (Micropædia)

R.K.U. Reuben Kenrick Udo. *Professor of Geography, University of Ibadan, Nigeria. Member, National Population Commission, Lagos. Author of Geographical Regions of Nigeria.*
WESTERN AFRICA (in part)

R.L. Robert Lekachman (d. 1989). *Distinguished Professor of Economics, Herbert H. Lehman College, City University of New York, 1973–89. Author of The Age of Keynes and others.*
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R.La. Robin Law. *Professor of African History, University of Stirling, Scotland. Author of The Slave Coast of West Africa, 1550–1750 and others.*
WESTERN AFRICA (in part)

R.L.A. Russell L. Ackoff. *Chairman, Interact: The Institute for Interactive Management, Bala Cynwyd, Pennsylvania. Anheuser-Busch Professor Emeritus of Management Science, Wharton School, University of Pennsylvania, Philadelphia. Coauthor of Fundamentals of Operations Research.*
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R.L.B. The Rev. Robert L. Bireley, S.J. *Professor of History, Loyola University, Chicago.*
XAVIER, SAINT FRANCIS (Micropædia)

R.L.C. Robert L. Collison (d. 1989). *Professor of Library Science and Information Studies, University of*

California, Los Angeles, 1968–73. Author of Encyclopaedias: Their History Throughout the Ages and others.
ENCYCLOPAEDIAS AND DICTIONARIES (in part)

R.Le. Robert Lebel (d. 1986). *Art expert, critic, and writer. Author of On Marcel Duchamp and others.*
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R.L.F. Robert Louis Folk. *Dave P. Carlton Professor Emeritus of Geology, University of Texas at Austin. An authority on the classification and interpretation of sedimentary rocks. Author of Petrology of Sedimentary Rocks.*
MINERALS AND ROCKS (in part)

R.L.Fr. Richard L. Frey (d. 1988). *Editor in Chief, Official Encyclopedia of Bridge, 1964–76. Editor, The Contract Bridge Bulletin, 1958–70. President, International Bridge Press Association, 1970–81. Author of According to Hoyle and others.*
CRIBBAGE (Micropædia)

R.L.G. Roger Lancelyn Green (d. 1987). *Author of The Story of Lewis Carroll and others; editor of The Diaries of Lewis Carroll.*
CARROLL, LEWIS (Micropædia)

R.L.Ge. Robert Louis Gilmore. *Emeritus Professor of History, University of Kansas, Lawrence.*
COLOMBIA (in part)

R.L.Ha. Rosemary Lois Harris. *Reader in Anthropology, University College, University of London. Author of The Political Organization of the Mbembe of South-East Nigeria and others.*
WESTERN AFRICA (in part)

R.L.He. Robert L. Heilbroner. *Norman Thomas Professor Emeritus of Economics, New School for Social Research, New York City. Author of The Worldly Philosophers; The Nature and Logic of Capitalism; and others.*
ECONOMIC SYSTEMS (in part)
SMITH, ADAM

R.L.Hi. Richard Leslie Hill (d. 1996). *Professor of History, Abdullahi Bayero College, Ahmadu Bello University, Kano, Nigeria, 1968–69. Lecturer in Modern Near Eastern History, University of Durham, England, 1949–66. Author of The Europeans in Sudan, 1834–78 and others.*
MAHDI, AL- (Micropædia)

R.L.K. Russell L. King. *Professor of Geography, University of Sussex, Brighton, England. Author of The Industrial Geography of Italy and others.*
ITALY (in part)

R.L.M. Robert L. McPherron. *Professor of Geophysics and Space Physics, University of California, Los Angeles.*
EARTH, THE (in part)

R.L.McC. R.L. McCullough. *Professor of Chemical Engineering, University of Delaware, Newark; former Director, Center for Composite Materials. Author of Concepts of Fiber-Resin Composites.*
MATERIALS SCIENCE (in part)

R.L.Mo. Richard Lee Morton (d. 1974). *Professor of History, College of William*

and Mary, Williamsburg, Virginia, 1921–59. Author of Colonial Virginia.
UNITED STATES OF AMERICA (in part)

R.L.P. Robert Lewis Parkinson (d. 1991). *Chief Librarian and Historian, Circus World Museum, Baraboo, Wisconsin, 1965–91. Author of The First 100 Years of the Greatest Show on Earth.*
CIRCUS (in part)

R.L.S. Robert L. Scranton (d. 1993). *Professor of Classical Art and Archaeology, University of Chicago, 1961–77. Author of Aesthetic Aspects of Ancient Art, Corinth (vol. 1, 3, and 16).*
ARCHITECTURE, THE HISTORY OF WESTERN (in part)

R.L.Sc. Robert L. Scheina. *Historian, U.S. Coast Guard, Washington, D.C. Author of U.S. Coast Guard Cutters and Craft of World War II; coauthor of American Battleships, 1886–1923.*
WAR, THE TECHNOLOGY OF (in part)

R.L.Se. Robert L. Seale. *Professor of Nuclear and Energy Engineering, University of Arizona, Tucson. Coeditor of Water Production Using Nuclear Energy.*
ENERGY CONVERSION (in part)

R.L.Sm. Robert Leo Smith. *Professor of Wildlife Biology and Ecology, West Virginia University, Morgantown. Author of Ecology and Field Biology.*
BIOLOGICAL SCIENCES, THE (in part)

R.L.S.-R. Reginald Leslie Smith-Rose (d. 1980). *Secretary-General, Inter-Union Commission on Frequency Allocations for Radio Astronomy and Space Science, 1961–73. Director, Radio Research, Department of Scientific and Industrial Research, London, 1948–60.*
MARCONI, GUGLIELMO (Micropædia)
POPOV, ALEKSANDR STEPANOVICH (Micropædia)

R.L.Su. Robert Lee Suettinger. *Author of "The Political Process" in China: A Country Study.*
CHINA (in part)

R.L.Sw. Roland Lee Swink. *Former Director, Adult Evening Education Program, 10th Combat Support Group, United States Air Forces in Europe. Former Lecturer in Education, University of Maryland, Overseas Division. Author of A Comparison of the Academic Achievement of English and American School Boys and Girls, Ages 12 and 17.*
EDUCATION, HISTORY OF (in part)

R.L.W. Ralph Lee Woodward, Jr. *Professor of Latin American History, Tulane University, New Orleans. Author of Central America: A Nation Divided and others.*
CENTRAL AMERICA (in part)

R.L.Z. Richard L. Zusi. *Curator Emeritus, Division of Birds, National Museum of Natural History, Smithsonian Institution, Washington, D.C. Author of Structural Adaptations of the Head and Neck in the Black Skimmer, Rynchops nigra Linnaeus.*
BIRDS (in part)

R.M. Roger Manvell (d. 1987). *Biographer and film historian. University*

Professor of Film; Boston University. Director, British Film Academy, 1947–59. Author of Ellen Terry; coauthor of Hermann Göring; The Technique of Film Animation; and many others.

BROADCASTING (in part)
GÖRING, HERMANN (in part) (Micropædia)
MOTION PICTURES (in part)
TERRY, ELLEN (Micropædia)

R.Ma. Roger Martinot. *Engineer in Chief, Rural Lands, Water, and Forests, National Institute of Agricultural Research, Paris. Coauthor of La Stabulation libre des bovins Eyrolles.*

FARMING AND AGRICULTURAL TECHNOLOGY (in part)

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IBSEN, HENRIK (Micropædia)

R.MacM. Ramsay MacMullen. *Dunham Professor of History and Classics, Yale University. Author of Roman Social Relations; Corruption and the Decline of Rome.*

GREEK AND ROMAN CIVILIZATIONS, ANCIENT (in part)

R.M.As. Robert McCormick Adams. *Secretary, Smithsonian Institution, Washington, D.C., 1984–94. Provost, University of Chicago, 1982–84; Harold H. Swift Distinguished Service Professor of Anthropology, 1975–84; Director, Oriental Institute, 1962–68 and 1981–82.*

PREHISTORIC PEOPLES AND CULTURES (in part)

R.M.B. Ronald M. Berndt (d. 1990). *Foundation Professor of Anthropology, University of Western Australia, Nedlands, 1963–81. Coauthor of The World of the First Australians and others.*
AUSTRALIA (in part)

R.McD. Raven I. McDavid, Jr. (d. 1984). *Professor of English and of Linguistics, University of Chicago, 1964–77. Coauthor of The Pronunciation of English in the Atlantic States; editor of H.L. Mencken's The American Language.*
WEBSTER, NOAH (Micropædia)

R.McMu. Roy Donald McMullen (d. 1984). *Art historian. Author of Art, Affluence, and Alienation; The World of Marc Chagall; and others.*

BRAQUE, GEORGES (Micropædia)
CHAGALL, MARC (Micropædia)
DAVID, JACQUES-LOUIS (Micropædia)
FOLK ARTS (in part)
KANDINSKY, WASSILY (in part) (Micropædia)

LÉGER, FERNAND (in part) (Micropædia)
MATISSE, HENRI (in part) (Micropædia)
ROUAULT, GEORGES (Micropædia)

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MUSCLES AND MUSCLE SYSTEMS (in part)

R.M.D. Richard M. Dorson (d. 1981). *Director, Folklore Institute; Professor of History and Folklore, Indiana University, Bloomington, 1957–81. Author of*

American Folklore; Folklore and Fakelore; and others.

FOLK ARTS (in part)

R.Me. Reinhold Merkelbach. *Emeritus Professor of Classics, University of Cologne, Germany. Author of Roman und Mysterium in der Antike and many others.*
MYSTERY RELIGIONS (in part)

R.M.G. Robert M. Grant. *Carl Darling Buck Professor Emeritus of Humanities; Emeritus Professor of Early Christian History, Divinity School, University of Chicago. Author of Historical Introduction to the New Testament and others.*

BIBLICAL LITERATURE AND ITS CRITICAL INTERPRETATION (in part)

R.M.H. Ragnhild Marie Hatton (d. 1995). *Professor of International History, London School of Economics and Political Science, University of London, 1968–80. Author of Charles XII of Sweden and others.*

CHARLES XII (SWEDEN) (Micropædia)

R.M.Ha. Robert M. Hazen. *Staff Scientist, Geophysical Laboratory, Carnegie Institution of Washington, D.C. Clarence Robinson Professor of Earth Science, George Mason University, Fairfax, Virginia. Author of The New Alchemists: Breaking Through the Barriers of High Pressure and others.*

MATTER (in part)

R.M.He. Robert M. Henderson. *Chief, General Library and Museum of the Performing Arts, New York Public Library at Lincoln Center, New York City. Author of D.W. Griffith, His Life and Times and others.*

GRIFFITH, D.W. (Micropædia)

R.M.Hi. Richard M. Highsmith, Jr. (deceased). *Professor of Geography, Oregon State University, Corvallis. Coauthor of Conservation in the United States.*
UNITED STATES OF AMERICA (in part)

R.M.Ke. Roger M. Keesing (d. 1993). *Professor of Anthropology, McGill University, Montreal, 1990–93. Professor of Anthropology, Research School of Pacific Studies, Australian National University, Canberra, 1974–90. Author of Melanesian Pidgin and The Oceanic Substrate and others.*

PACIFIC ISLANDS (in part)

R.M.L. R.M. Lockley. *Naturalist. Author of Shearwaters; Puffins; and others; coauthor of Sea Birds of the North Atlantic.*
BIRDS (in part)

R.M.Le. Richard M. Leighton. *Military historian and consultant. Professor of National Security Affairs, National Defense University, U.S. Department of Defense, Washington, D.C., 1965–78. Coauthor of Global Logistics and Strategy 1940–45.*

WAR, THE THEORY AND CONDUCT OF (in part)

R.M.Lu. R.M. Lumiansky (d. 1987). *Professor of English, New York University, New York City, 1975–83. Author of Of Sundry Folk: The Dramatic Principle in the Canterbury Tales and others.*

CHAUCER (in part)

R.Mo. Rudolf Morsey. *Professor of Modern History, Postgraduate School for Administrative Sciences, Speyer, Germany. Author of Die deutsche Zentrumspartei, 1917–1923 and others.*

STRESEMANN, GUSTAV (Micropædia)

R.M.O. Richard Marian Ogorkiewicz. *Professor, Royal Military College of Science, Cranfield University, Shrivenham, England. Author of Armour and others.*
WAR, THE TECHNOLOGY OF (in part)

R.M.Og. Robert Maxwell Ogilvie (d. 1981). *Professor of Humanity, University of St. Andrews, Scotland. Editor of A Commentary on Livy, Books 1–5.*
LIVY (Micropædia)

R.M.P. Rita M. Pelczar. *Horticulturist. Freelance horticulture writer.*

BIOLOGICAL SCIENCES, THE (in part)
DISEASE (in part)

R.M.S. Ronald Milton Schneider. *Professor of Political Science at Queens College, New York City. Author of Brazil: Culture and Politics in a New Industrial Powerhouse and Order and Progress: A Political History of Brazil.*

BRAZIL (in part)

R.M.Sa. Roger M. Savory. *Emeritus Professor of Middle East and Islamic Studies, University of Toronto. Translator of The History of Shah 'Abbas.*
'ABBAS I (PERSIA) (Micropædia)

R.M.T. R. Murray Thomas. *Emeritus Professor of Education, University of California, Santa Barbara. Author of Comparing Theories of Child Development and others.*
EDUCATION, HISTORY OF (in part)

R.Mu. Ronaldo Munck. *Former Professor of Sociology, University of Durban-Westville, South Africa. Author of Latin America: The Transition to Democracy and others.*
WORK AND EMPLOYMENT (in part)

R.My. Rollo H. Myers (d. 1985). *Writer on music. Author of Modern French Music; Ravel: Life and Works; and others.*
RAVEL, MAURICE (Micropædia)

R.Na. Raghavan Narasimhan. *Professor of Mathematics, University of Chicago. Author of Analysis on Real and Complex Manifolds; Several Complex Variables and others.*

ANALYSIS (IN MATHEMATICS) (in part)

R.N.Bu. Robert N. Burr. *Emeritus Professor of History, University of California, Los Angeles. Author of Troubled Hemisphere and others.*
PERU (in part)

R.N.C. Richard N. Current. *University Distinguished Professor Emeritus of History, University of North Carolina, Greensboro. Author of Daniel Webster and the Rise of National Conservatism; The Lincoln Nobody Knows; and others.*

LINCOLN
WEBSTER, DANIEL (Micropædia)

R.N.F. Richard N. Frye. *Aga Khan Professor Emeritus of Iranian, Harvard University. Director, Asia Institute, Pahlavi*

University, Shīrāz, Iran, 1969–74. *Author of The History of Ancient Iran and others.*
CYRUS II (Micropædia)
KHOSROW I (Micropædia)
MESOPOTAMIA, THE HISTORY OF ANCIENT (in part)

R.Ni. Romola Nijinsky (d. 1978). *Author of Nijinsky; The Last Years of Nijinsky; editor of The Diary of Vaslav Nijinsky.*
NIJINSKY, VASLAV (Micropædia)

R.N.S. The Rev. R. Norman Sharp (d. 1995). *Assistant Professor of Old Persian and Pahlavi, Pahlavi University, Shīrāz, Iran, 1962–67. Author of The Inscriptions of the Achaemenian Emperors in Old Persian Cuneiform and others.*
PERSEPOLIS (Micropædia)

R.O. Ron Olver. *British correspondent, The Ring, Former Assistant Editor, Boxing World; Boxing News. Coauthor of Boxing.*
SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

Ro.A. Roberto Almagià (d. 1962). *Professor of Geography, University of Rome, 1915–59. Author of Il mondo attuale and many others.*
VESPUCCI, AMERIGO (Micropædia)

Ro.A.K. Roy A. Keller. *Professor of Chemistry, State University of New York College at Fredonia. Former Editor, Journal of Chromatographic Science.*
ANALYSIS AND MEASUREMENT, PHYSICAL AND CHEMICAL (in part)

Ro.A.P. Roscoe A. Pike. *Manager, Polymer Science Materials Laboratory, United Technologies Research Center, East Hartford, Connecticut, 1985–92. Author of Stereochemistry of Olefins Obtained from Amine Oxides and Quarternary Ammonium Hydroxides and numerous papers on adhesive bonding.*
INDUSTRIAL POLYMERS (in part)

Ro.Au. Robert Auty (d. 1978). *Professor of Comparative Slavonic Philology, University of Oxford, 1965–78; Fellow of Brasenose College, Oxford.*
CZECH AND SLOVAK REPUBLICS (in part)

Rob.A.P. Robert A. Paul. *Charles Howard Candler Professor of Anthropology, Emory University, Atlanta, Georgia. Editor, ETHOS: Journal of the Society for Psychological Anthropology. Author of Moses and Civilization: The Meaning Behind Freud's Myth and others.*
SOCIAL SCIENCES (in part)

Ro.C. Robert Conquest. *Senior Research Fellow, Hoover Institution on War, Revolution and Peace, Stanford University, California. Author of The Great Terror: Stalin's Purge of the Thirties and many others.*
UNION OF SOVIET SOCIALIST REPUBLICS (in part)

R.O.C. Robert O. Collins. *Professor of History, University of California, Santa Barbara. Author of Shadows in the Grass: Britain in the Southern Sudan, 1918–1956 and others.*
SUDAN, THE (in part)

R.O.C.N. Sir Richard O.C. Norman (d. 1993). *Rector, Exeter College, University of Oxford. Professor of Chemistry, University*

of York, England, 1956–87. Author of Principles of Organic Synthesis.
CHEMICAL COMPOUNDS (in part)

Ro.D. Roger Davies. *Associate Professor of Atmospheric Science, University of Arizona, Tucson.*
CLIMATE AND WEATHER (in part)

R.O.F. Raymond Oliver Faulkner (deceased). *Fellow of University College, London; Lecturer in Ancient Egyptian, University College, University of London, 1955–67. Author of Egypt: From the Inception of the Nineteenth Dynasty to the Death of Ramesses III and others.*
RAMSES II (Micropædia)

Ro.G. Robert Grudin. *Professor of English, University of Oregon, Eugene. Author of The Grace of Great Things and others.*
HUMANISM

Ro.H. Roger Hood. *Professor of Criminology, Centre for Criminological Research, Oxford University. Author of The Death Penalty: A Worldwide Perspective and others.*
CAPITAL PUNISHMENT (Micropædia)

R.O.H. Raymond O. Harrison. *Architect. Former Director, Provincial Museum and Archives, Edmonton, Alberta.*
CANADA (in part)

Ro.H.R. Robert Henry Robins. *Emeritus Professor of General Linguistics, University of London. Author of General Linguistics.*
LANGUAGE (in part)

Ro.L. Robert Lechêne. *Journalist and popular science writer. Author of L'Imprimerie, de Gutenberg à l'électron.*
PRINTING, TYPOGRAPHY, AND PHOTOENGRAVING (in part)

Ro.M. Robert Merle. *Novelist. Author of Ahmed Ben Bella and others.*
BEN BELLA, AHMED (Micropædia)

Ro.Ma. Robert L. Marshall. *Sachar Professor of Music, Brandeis University, Waltham, Massachusetts. Author of The Compositional Process of J.S. Bach.*
BACH (in part)

Ro.N. Robert Niklaus. *Emeritus Professor of French, University of Exeter, England. Author of A Literary History of France: The Eighteenth Century; editor of Diderot's Pensées philosophiques; Lettre sur les aveugles.*
DIDEROT, DENIS (in part) (Micropædia)

Ro.P. Roy Perrott. *Freelance book editor and consultant. Fellow of the Royal Horticultural Society, London. Author of The Aristocrats.*
GARDENING AND HORTICULTURE (in part)

Ro.Pa. Roy Pascal (d. 1980). *Professor of German, University of Birmingham, England, 1939–69. Author of The German Novel and others.*
MANN, THOMAS (Micropædia)

Ro.Pe. Roger Pélissier (d. 1972). *Assistant Director, Centre for Far East Documentation, École Pratique des Hautes Études (Institute for Advanced Research), Paris. Author of The Awakening of China, 1793–1949.*
CH'EN-LUNG (Micropædia)

Ro.Po. Roland Pourtier. *Professor of Geography, University of Paris I. Author of Le Gabon (vol. 1–2).*
AFRICA (in part)

Ro.R. Rollin C. Richmond. *Provost, State University of New York at Stony Brook.*
GENETICS AND HEREDITY, THE PRINCIPLES OF (in part)

Ro.Ri. Roberto Ridolfi. *Member, Accademia Nazionale dei Lincei. Director, "National Editions of the Works of Savonarola." Director, La Bibliofilia, 1944–82. Author of Life of Machiavelli and others.*
MACHIARELLI, NICCOLÒ (in part) (Micropædia)
SAVONAROLA, GIROLAMO (Micropædia)

Ro.S. Ronald Strahan. *Honorary Historian, Australian Museum, Sydney. Director, Taronga Zoological Park, Sydney, 1967–74. Coauthor of The Biology of Myxine.*
FISHES (in part)

Ro.Sc. Roger Scruton. *Professor of Philosophy, Boston University, 1992–95. Professor of Aesthetics, Birkbeck College, University of London, 1985–92. Author of The Aesthetics of Architecture and others.*
AESTHETICS (in part)

Ro.Si. Roy Sieber. *Rudy Professor of Fine Arts, Indiana University, Bloomington. Associate Director, National Museum of African Art, Smithsonian Institution, Washington, D.C. Author of African Art in the Cycle of Life and others.*
DECORATIVE ARTS AND FURNISHINGS (in part)

Ro.So. Robert Soucy. *Professor of History, Oberlin (Ohio) College. Author of French Fascism: The First Wave, 1924–1933; French Fascism: The Second Wave, 1933–1939; and others.*
FASCISM

Ro.T. Robert Tonkinson. *Professor of Anthropology, University of Western Australia, Nedlands. The Mardu Aborigines.*
AUSTRALIA (in part)

Ro.W. Robert L. Wilken. *Professor of the History of Christianity, University of Notre Dame, Indiana. Author of The Myth of Christian Beginnings.*
TERTULLIAN (Micropædia)

Ro.W.C. Robert W. Conn. *Walter J. Zable Professor and Dean, School of Engineering, University of California, San Diego, at La Jolla. Editor, Fusion Engineering and Design.*
ATOMS (in part)

Ro.W.F. Robert W. Finley. *Emeritus Professor of Geography, University of Wisconsin, Madison. Author of Geography of Wisconsin: A Content Outline.*
UNITED STATES OF AMERICA (in part)

Ro.W.St. Robert Walter Steel. *Principal, University College of Swansea, 1974–82; Vice-Chancellor, University of Wales, 1979–81. John Rankin Professor of Geography, University of Liverpool, 1957–74. Director, Commonwealth Geographical Bureau, 1972–81.*
AFRICA (in part)

R.O.Wt. Sir Richard Olof Winstedt (d. 1966). *Reader in Malay, University of London, 1937–47. Author of Malay and Its History and others.*

SOUTHEAST ASIA (in part)

R.P. René Pélissier. *Authority on Portuguese- and Spanish-speaking Africa. Author of Don Quichotte en Afrique: Voyages à la fin de l'Empire espagnol and others.*

WESTERN AFRICA (in part)

R.P.A. Richard Paul Aulie. *Historian of science. Lecturer in Natural Science, Loyola University, Chicago, 1972–76. Associate Editor, Encyclopædia Britannica, Chicago, 1971–72.*

EUDOXUS OF CNIDUS (Micropædia)

R.Pal. Rodolfo Pallucchini (d. 1989). *Director, Institute of Art History, Giorgio Cini Foundation, Venice, 1972–89. Author of Disegni di Giambattista Tiepolo; La giovinezza del Tintoretto; and others.*

TIEPOLO, GIOVANNI BATTISTA (Micropædia)

TINTORETTO (in part) (Micropædia)

VERONESE, PAOLO (Micropædia)

R.P.An. Richard Paul Anschutz. *Emeritus Professor of Philosophy, University of Auckland, New Zealand. Author of Philosophy of J.S. Mill.*

MILL, JOHN STUART (in part)

R.P.B. Ronald Percy Bell (d. 1996). *Professor of Chemistry, University of Stirling, Scotland, 1967–75. Author of Acid-Base Catalysis and others.*

CHEMICAL REACTIONS (in part)

R.P.C.M. Reginald P.C. Mutter. *Emeritus Professor of English Literature, University of Sussex, Brighton, England. Editor of The History of Tom Jones.*

DEFOE, DANIEL (in part) (Micropædia)

ENGLISH LITERATURE (in part)

STEELE, SIR RICHARD (Micropædia)

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ELEANOR OF AQUITAINE (Micropædia)

VILLON, FRANÇOIS (Micropædia)

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UNITED KINGDOM (in part)

R.P.He. Robert Proulx Heaney, M.D. *John A. Creighton University Professor, Creighton University, Omaha, Nebraska; Vice President for Health Sciences, 1971–84. Coauthor of Skeletal Renewal and Metabolic Bone Diseases.*

SUPPORTIVE AND CONNECTIVE TISSUES (in part)

R.Pi. Robert Pick (d. 1978). *Freelance writer and editor. Author of Empress Maria Theresa.*

MARIA THERESA (Micropædia)

R.P.M. Robert P. Multhau. *Senior Historian, Smithsonian Institution, Washington, D.C. Author of The Origins of Chemistry; Neptune's Gift.*

OCCULTISM (in part)

R.P.Mo. Richard P. Momsen, Jr. *Emeritus Professor of Geography,*

University of Calgary, Alberta. Author of Brazil: A Giant Stirs.

BRAZIL (in part)

R.Po. Raphael Powell (d. 1965). *Professor of Roman Law, University of London, 1955–64.*

LEGAL SYSTEMS, THE EVOLUTION OF MODERN WESTERN (in part)

R.P.S. Robert P. Scharlemann. *Commonwealth Professor of Religious Studies, University of Virginia, Charlottesville. Author of Reflection and Doubt in the Thought of Paul Tillich.*

PROTESTANTISM (in part)

SCHLEIERMACHER, FRIEDRICH (Micropædia)

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GREEK AND ROMAN CIVILIZATIONS, ANCIENT (in part)

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FOOD PROCESSING (in part)

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GEOMORPHIC PROCESSES (in part)

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ŌSAKA-KÔBE METROPOLITAN AREA (in part)

R.Q. Ricardo Quintana. *Emeritus Professor of English, University of Wisconsin, Madison. Author of Mind and Art of Jonathan Swift; Oliver Goldsmith: A Georgian Study.*

SWIFT, JONATHAN (in part) (Micropædia)

R.R. Romney Robinson. *Professor of Economics, University of Toronto, 1967–70. Associate Professor of Economics, Brandeis University, Waltham, Massachusetts, 1955–67.*

INTERNATIONAL TRADE (in part)

R.R.B. Richard R. Beeman. *Professor of History, University of Pennsylvania, Philadelphia. Author of The Old Dominion and the New Nation, 1788–1801 and others.*

UNITED STATES OF AMERICA (in part)

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ŚIVAJĪ (Micropædia)

R.R.Di. Randall R. Dipert. *Professor of Philosophy, State University of New York College at Fredonia. Coauthor of Logic: A Computer Approach.*

LOGIC, THE HISTORY AND KINDS OF (in part)

R.R.H. Robert R. Haynes. *Professor of Biology, University of Alabama, Tuscaloosa. Coauthor of Poisonous Plants and Venomous Animals of Alabama.*

ANGIOSPERMS (in part)

R.Ri. Raymond Ritter (d. 1974). *Attorney. Editor in Chief, Pyrénées (review). Author of Henry IV lui-même; editor of Lettres du cardinal de Florence sur Henri IV et sur la France (1596–1598).*

HENRY IV (FRANCE) (in part) (Micropædia)

R.R.K. Ralph R. Krueger. *Emeritus Professor of Geography, University of Waterloo, Ontario. Coauthor of Canada: A New Geography and others.*

CANADA (in part)

R.R.M.C. Richard Ralph Mowbray Clogg. *Associate Fellow, St. Antony's College, University of Oxford. Professor of Modern Balkan History, University of London. Author of A Concise History of Greece and others.*

GREECE (in part)

R.R.Pr. Richard Riseley Proud (d. 1975). *Lieutenant Colonel, Indian Army.*

NEPAL (in part)

R.R.R. Richard R. Ring. *Former Assistant Professor of History, Ripon (Wisconsin) College.*

ROME (in part)

R.R.S. Robert R. Stoll (deceased). *Professor of Mathematics, Cleveland State University, Ohio, 1971–80. Author of Set Theory and Logic.*

SET THEORY (in part)

R.R.Sh. Robert R. Shannon. *Emeritus Professor of Optical Sciences, University of Arizona, Tucson. Coeditor of Applied Optics and Optical Engineering (vol. 7–11).*

MICROSCOPES (in part)

R.R.W. Robert R. Wagner, M.D. *Marion McNulty and Malvin C. Weaver Professor of Oncology and Microbiology, University of Virginia, Charlottesville. Coeditor of Comprehensive Virology (19 vol.); The Viruses (26 vol.).*

VIRUSES

R.S. Roger Sharrock (d. 1991). *Professor of English Language and Literature, King's College, University of London, 1968–81. Author of John Bunyan and others; editor of Oxford Bunyan.*

BUNYAN, JOHN (in part) (Micropædia)

R.S.B. Rupert Stevenson Bradley (deceased). *Reader in Inorganic and Structural Chemistry, University of Leeds, England. Coauthor and editor of High Pressure Physics and Chemistry.*

BRIDGMAN, P.W. (in part) (Micropædia)

R.S.Be. R. Stephen Berry. *James Franck Distinguished Service Professor of Chemistry, University of Chicago.*

Coauthor of Physical Chemistry and others.

CHEMICAL REACTIONS (in part)

MATTER (in part)

R.Sc. R.A.M. Schmidt. *Consulting geologist. Chairman, Geology Department, Anchorage Community College, University of Alaska. Geologist, Geological Survey, U.S. Department of the Interior, 1943–56; District Geologist, Anchorage, 1956–63.*

NORTH AMERICA (in part)

R.S.Ca. Robert S. Carmichael. *Professor of Geophysics and Geology, University of*

Iowa, Iowa City. *Editor of Handbook of Physical Properties of Rocks* (3 vol.). MINERALS AND ROCKS (in part)

R.Sch. Reiner Schürmann (d. 1993). *Professor of Philosophy, Graduate Faculty, New School for Social Research, New York City, 1984–93. Author of Meister Eckhart, Mystic and Philosopher and others.* ECKHART, MEISTER (Micropædia)

R.S.Co. Robin Sinclair Cormack. *Professor of the History of Art, Courtauld Institute of Art, University of London. Author of Writing in Gold; The Byzantine Eye.* PAINTING, THE HISTORY OF WESTERN (in part)

R.S.De. The Most Rev. Ralph Stanley Dean (d. 1987). *Executive Officer, Anglican Communion, 1964–69. Archbishop of Cariboo and Metropolitan of the Anglican Province of British Columbia, 1971–73. Rector, Church of the Redeemer; Greenville, South Carolina, 1979–87. Author of In the Light of the Cross.* PROTESTANTISM (in part)

R.S.Du. Richard S. Dunn. *Professor of History, University of Pennsylvania, Philadelphia. Author of Puritans and Yankees and others.* WINTHROP, JOHN (Micropædia)

R.Sh. Robert Shackleton (d. 1986). *Marshal Foch Professor of French Literature, University of Oxford, 1979–86; Bodley's Librarian, 1966–79. Author of Montesquieu: A Critical Biography.* MONTESQUIEU, CHARLES-LOUIS DE SECONDAT, BARON DE LA BREDE ET DE (in part) (Micropædia)

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Harwell, England, 1964–68. Author of the obituary memoir on Otto Hahn for the Royal Society.

HAHN, OTTO (Micropædia)

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Sc.D. Scott Decker. *Professor of Criminology and Criminal Justice, University of Missouri at St. Louis. Coauthor of Confronting Gangs: Crime and Community; Life in the Gang: Family, Friends and Violence; and others.*
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S.C.E. Søren Christian Egerod (d. 1995). *Professor of East Asian Languages, University of Copenhagen, 1958–93. Editor, Acta Orientalia. Author of Atayal-English Dictionary and others.*
LANGUAGES OF THE WORLD (in part)

S.Ch. Sripati Chandrasekhar. *Vice-Chancellor, Annamalai University, India, 1975–78. Member, Rajya Sabha (upper house of the Indian Parliament), 1964–70. Minister of Health, Family Planning, and Urban Development, Government of India, 1966–70. Author of Asia's Population Problems and others.*
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ŚAṅKARA (Micropædia)

S.E.M. Samuel E. Martin. *Emeritus Professor of Linguistics, Yale University, New Haven, Connecticut. Author of A Reference Grammar of Korean: A Complete Guide to the Grammar and History of the Korean Language and many others.*

LANGUAGES OF THE WORLD (in part)

S.E.McG. Samuel Emmett McGregor (d. 1980). *Apiculturist, Bee Research Laboratory, U.S. Department of Agriculture, Tucson, Arizona. Coauthor of Beekeeping in the United States.*

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S.G.W. Stephen Graham Wright. *Former Adviser at the National Library of Ethiopia and at Haile Selassie I University, Addis Ababa.*

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Sh.Bi. Sh. Bira. *General Secretary, International Association for Mongol Studies, Ulaanbaatar.*

MONGOLIA (in part)

S.H.Bl. Sheldon H. Blank (d. 1989). *Professor of Bible, Hebrew Union College-Jewish Institute of Religion, Cincinnati, Ohio, 1926–78. Author of Prophetic Faith in Isaiah and others.*

ISAIAH (Micropædia)

S.He. **Stanislaw Herbst** (d. 1973). *Professor of Pre-18th Century Polish History, University of Warsaw. President, Polish Historic Society, Warsaw. Coauthor of A Thousand Years of Polish History.*
KOŚCIUSZKO, TADEUSZ (Micropædia)

S.H.F.L. **Seton H.F. Lloyd** (d. 1996). *Professor of Western Asiatic Archaeology, University of London, 1962–69. Author of Early Highland Peoples of Anatolia; Ancient Turkey; and others.*

ASIA (in part)

INDIA (in part)

MIDDLE EASTERN ARTS AND ARCHITECTURE,
ANCIENT (in part)

TURKEY AND ANCIENT ANATOLIA (in part)

Sh.H. **Shigeru Hayashi** (d. 1985). *Professor, Institute of Social Science, University of Tokyo. Author of The Pacific War.*

KONOE FUMIMARO, KOSHAKU (Micropædia)

Sh.Ha. **Shirley Hazzard**. *Novelist and writer on Italian cultural themes. Author of The Transit of Venus; The Bay of Noon; and others.*

NAPLES

S.H.J. **Susan Heyner Joshi**. *Professor of Obstetrics and Gynecology, University of Pennsylvania, Philadelphia.*

BIOLOGICAL SCIENCES, THE (in part)

S.H.L. **Sandra H. Levinson**. *Executive Director, Center for Cuban Studies, Inc., New York City. Coeditor of Venceremos Brigade.*

WEST INDIES, THE (in part)

Sh.M. **Shula E. Marks**. *Professor of the History of Southern Africa, School of Oriental and African Studies, University of London; Director, Institute of Commonwealth Studies, 1983–93. Author of The Ambiguities of Dependence in Southern Africa and others.*

SOUTHERN AFRICA (in part)

S.H.N. **Seyyed Hossein Nasr**. *University Professor of Islamic Studies, George Washington University, Washington, D.C. Author of Three Muslim Sages.*

AVICENNA (Micropædia)

S.H.O. **Simeon Hongo Ominde**. *Professor of Geography; Director, Population Studies and Research Institute, University of Nairobi, Kenya. Author of Land and Population Movements in Kenya.*

EASTERN AFRICA (in part)

S.H.P. **Stewart Henry Perowne** (d. 1989). *Orientalist, historian, and lecturer. Author of The Life and Times of Herod the Great; The End of the Roman World; The Political Background of the New Testament; and others.*

CLEOPATRA VII THEA PHILOPATOR
(Micropædia)

HEROD (Micropædia)

JERUSALEM (in part)

JULIAN (Micropædia)

S.H.S. **Stephen H. Schneider**. *Professor of Biological Sciences, Stanford University, California. Editor, Climatic Change. Author of Global Warming: Are We Entering the Greenhouse Century?*

CLIMATE AND WEATHER (in part)

S.H.St. **S. Henry Steinberg** (d. 1969). *Editor, The Statesman's Year-Book, 1946–69. Author of The Thirty Years' War and the Conflict for European Hegemony, 1600–1660 and others.*

WALLENSTEIN, ALBRECHT WENZEL EUSEBIUS
VON, HERZOG VON FRIEDLAND
(Micropædia)

Sh.Ts. **Sh. Tsegmid**. *Director, Institute of Geography and Geocryology, Academy of Sciences, Ulaanbaatar, Mongolia.*

MONGOLIA (in part)

S.H.W. **Stanley H. Weitzman**. *Curator of Fishes, Division of Fishes, National Museum of Natural History, Smithsonian Institution, Washington, D.C. Author of numerous articles on fishes.*

FISHES (in part)

S.I.B. **Solomon Ilich Bruk**. *Former Chief Researcher, Institute of Ethnography, Academy of Sciences of the U.S.S.R., Moscow. Author of several books on ethnic demography.*

ASIA (in part)

TRANSCAUCASIA (in part)

S.I.F. **Stanley I. Fischler**. *Broadcaster, Sports Channel TV, New York City. Columnist, The Hockey News. Coauthor of The Hockey Encyclopedia; Everybody's Hockey Book.*

SPORTS, MAJOR TEAM AND INDIVIDUAL
(in part)

Si.L. **The Rev. Sione Lātūkefu** (d. 1995). *Principal, Pacific Theological College, Suva, Fiji. Author of Church and State in Tonga.*

PACIFIC ISLANDS (in part)

S.I.W. **Stanley I. Weiss**. *Senior Lecturer in Aeronautics and Astronautics, Massachusetts Institute of Technology, Cambridge, Massachusetts. Visiting Professor of Mechanical and Aeronautical Engineering, University of California, Davis. Consulting Professor of Aeronautics and Astronautics, Stanford University, California.*

INDUSTRIES, MANUFACTURING (in part)

S.J.B. **Shahid Javed Burki**. *Director, International Bank for Reconstruction and Development, Washington, D.C. Author of Pakistan Under Bhutto and others.*

PAKISTAN (in part)

S.J.C. **Stanley James Curtis** (deceased). *Reader in Education, University of Leeds, England, 1955–58; Honorary Lecturer in Medieval Philosophy, 1934–58.*

FROEBEL, FRIEDRICH (in part) (Micropædia)

S.J.F. **Stephen Joseph Fonash**. *Alumni Professor of Engineering Sciences; Director, Center for Electronic Materials and Processing, Pennsylvania State University, University Park. Author of Solar Cell Device Physics.*

ENERGY CONVERSION (in part)

S.J.G. **Stephen J. Greenblatt**. *Class of 1932 Professor of English Literature, University of California, Berkeley. Author of Renaissance Self-Fashioning: From More to Shakespeare and others.*

ELIZABETH I OF ENGLAND

S.J.K.B. **Samuel John Kenneth Baker** (d. 1992). *Professor of Geography, Makerere*

University, Kampala, Uganda, 1949–67. Honorary Lecturer in Geography, University of Leicester, England, 1968–74.
AFRICA (in part)

S.J.P. **Stanton J. Peale**. *Professor of Physics, University of California, Santa Barbara.*

MECHANICS (in part)

S.J.S. **Stanford Jay Shaw**. *Professor of Turkish and Judeo-Turkish History, University of California, Los Angeles. Editor in Chief, International Journal of Middle East Studies. Author of History of the Ottoman Empire and Modern Turkey and others.*

TURKEY AND ANCIENT ANATOLIA (in part)

S.J.W. **Stephen J. Wayne**. *Professor of Government, Georgetown University, Washington, D.C. Author of The Road to the White House 2000; The Legislative Presidency; and others.*

ELECTORAL COLLEGE (Micropædia)

S.K. **Shinzo Kiuchi**. *Emeritus Professor of Geography, University of Tokyo. Coeditor of Japanese Cities.*

ŌSAKA-KÔBE METROPOLITAN AREA (in part)

S.Ka. **Sidney Karin**. *Professor of Computer Science and Engineering; Director, Office of Advanced Scientific Computing, University of California, San Diego, at La Jolla. Coauthor of The Supercomputer Era.*

SUPERCOMPUTER (Micropædia)

S.Kh. **Stella Kramrisch** (d. 1993). *Curator, Indian and Himalayan Art, Philadelphia Museum of Art, 1954–72. Adjunct Professor of Indian Art, Institute of Fine Arts, New York University, New York City, 1965–92. Author of The Art of Nepal; The Presence of Siva; and others.*

CENTRAL ASIAN ARTS (in part)

S.K.S. **Sylvester K. Stevens** (d. 1974). *Executive Director, Pennsylvania Historical and Museum Commission, Harrisburg, 1956–72. Author of Pennsylvania: Birthplace of a Nation.*
PHILADELPHIA (in part)

S.La. **Sylvia Dorothy Lawler, M.D.** (d. 1996). *Professor of Human Genetics, Institute of Cancer Research, University of London, 1980–87. Honorary Consultant in Immunology and Cytogenetics, Royal Marsden Hospital, London. Coauthor of Human Blood Groups and Inheritance.*
BLOOD (in part)

S.Lr. **Samuel Leiter**. *Former Seminary Professor of Hebrew Literature, Jewish Theological Seminary of America, New York City. Editor of Selected Stories of S.Y. Agnon.*

HEBREW LITERATURE (in part)

S.L.R. **Stanley L. Robbins, M.D.** *Visiting Professor of Pathology, Harvard University. Senior Pathologist, Brigham and Women's Hospital, Boston. Author of Pathologic Basis of Disease and others.*
DISEASE (in part)

S.Ma. **Sibyl Marcuse**. *Curator, Yale University Collection of Musical Instruments, 1952–60. Author of Musical Instruments: A Comprehensive*

Dictionary; A Survey of Musical Instruments.

MUSICAL INSTRUMENTS (in part)

S.M.B. Surinder M. Bhardwaj. *Professor of Geography, Kent State University, Ohio. Author of Hindu Places of Pilgrimage in India: A Study in Cultural Geography.*

ASIA (in part)

INDIA (in part)

S.McC.H. Sarah McCanless Howell. *Professor of History, Middle Tennessee State University, Murfreesboro.*

UNITED STATES OF AMERICA (in part)

S.McD. Sheila D. McDonough. *Professor of Religion, Sir George Williams University, Montreal. Author of Muhammad Ali Jinnah, Maker of Modern Pakistan and others.*

IQBÁL, SIR MUHAMMAD (Micropædia)

S.McG. Sharon McGrayne. *Science writer; former journalist.*

ATOMS (in part)

ELECTRICITY AND MAGNETISM (in part)

S.M.Ci. Sima M. Ćirković. *Professor of the Medieval History of Yugoslavia, University of Belgrade. Author of Duke Stefan Vukčić Kosača and His Time; Istorija srednjovekovne bosanske države.*

STEFAN, DUŠAN (Micropædia)

S.M.D. Stephanie Mary Dalley. *Senior Research Fellow, Somerville College, Oxford; Shillito Fellow in Assyriology, Oriental Institute, University of Oxford.*

SARGON (AKKAD) (Micropædia)

S.M.G. Stanley M. Garn. *Emeritus Professor of Human Nutrition and of Anthropology; Fellow of the Center for Human Growth and Development, University of Michigan, Ann Arbor. Author of Human Races and others.*

EVOLUTION, HUMAN (in part)

S.M.H. Sigismund M. Herschdoerfer (d. 1993). *Chief Chemist and Quality Controller, T. Wall & Sons Ltd. (ice cream), London. Editor of Quality Control in the Food Industry.*

FOOD PROCESSING (in part)

S.Mi. Sandra Millikin. *Freelance architectural historian. Lecturer in the History of Art, Open University, Walton, England. 1971–73.*

ADAM, ROBERT (Micropædia)

ARCHITECTURE, THE HISTORY OF WESTERN (in part)

S.M.I. S.M. Ikram (d. 1973). *Director, Institute of Islāmic Culture, Lahore, Pakistan. Author of History of Muslim Civilisation in India and Pakistan.*

AHMAD KHAN, SIR SAYYID (in part)
(Micropædia)

S.M.M. Sidnie M. Manton (d. 1979). *Reader in Zoology, King's College, University of London, 1949–60.*

SUPPORTIVE AND CONNECTIVE TISSUES (in part)

S.Mo. Sitanshu Mookerjee. *President, Indian Institute of Geography. Principal, Morris College, Nāgpur (India) University.*

INDIA (in part)

S.M.P. Stephen Maxfield Parrish. *Goldwin Smith Professor Emeritus of*

English, Cornell University, Ithaca, New York. Author of The Art of the Lyrical Ballads and others.

WORDSWORTH, WILLIAM (Micropædia)

S.M.R. Sidney Martin Robbins. *Chase Manhattan Professor Emeritus of Financial Institutions, Columbia University. Author of Securities Markets.*

MARKETS (in part)

S.M.S. Shekou M. Sesay. *Deputy Secretary-General, Mano River Union, Freetown, Sierra Leone. Coauthor of Sierra Leone in Maps.*

WESTERN AFRICA (in part)

S.M.Sn. Samuel Miklos Stern (d. 1969). *Fellow of All Souls College, University of Oxford, 1957–69. Author of Les Chansons mozarabes and others.*

COINS AND COINAGE (in part)

S.M.Sz. S.M. Sze. *Member of the technical staff, AT&T Bell Laboratories, Murray Hill, New Jersey. Author of Physics of Semiconductor Devices.*

ELECTRONICS (in part)

S.N.B. Steven N. Blair. *Director, Epidemiology and Clinical Applications, Cooper Institute for Aerobics Research, Dallas, Texas. President, American College of Sports Medicine.*

EXERCISE AND PHYSICAL CONDITIONING (in part)

S.N.M. S.N. Mukerji. *Dean, Faculty of Education, Maharaja Sayajirao University of Baroda, India, 1949–65. Dean of Studies, National Institute of Education, New Delhi, 1965–68. Author of History of Education in India and others.*

EDUCATION, HISTORY OF (in part)

S.N.W. S. Nicholas Woodward. *Fellow, Templeton College—the Oxford Centre for Management Studies, University of Oxford. Coauthor of Finance for Managers.*

BUSINESS ORGANIZATION (in part)

S.O.F. Stephen Oliver Fought. *Professor, U.S. Naval War College, Newport, Rhode Island. Author of SDI: A Policy Analysis.*

WAR, THE TECHNOLOGY OF (in part)

So.T. Sol Tax (d. 1995). *Professor of Anthropology, University of Chicago, 1948–76. Director, Center for the Study of Man, Smithsonian Institution, Washington, D.C., 1968–76. Editor, Current Anthropology, 1957–74. Authority noted for his work in American Indian ethnology and in the theory of social anthropology.*

BOAS, FRANZ (Micropædia)

S.P. Simeon Potter (d. 1976). *Bains Professor of English Language and Philology, University of Liverpool, England, 1945–65. Author of Our Language and others.*

LANGUAGES OF THE WORLD (in part)

S.P.C. Shiba P. Chatterjee (d. 1989). *Professor of Geography, University of Calcutta. Author of Physiography of India and others; editor of Selected Papers of the 21st International Geographical Congress (vol. 1–4).*

ASIA (in part)

INDIA (in part)

S.P.D. Stephen Porter Dunn. *Director of Research, Highgate Road Social Science Research Station, Inc., Berkeley, California. Coauthor of The Peasants of Central Russia.*

ASIAN PEOPLES AND CULTURES (in part)

S.Pi. Shlomo Pines (d. 1990). *Professor of General and Jewish Philosophy, Hebrew University of Jerusalem, 1952–77. Author of Scholasticism after Thomas Aquinas and the Teachings of Hasdai Crescas and his Predecessors; translator of Maimonides' Guide of the Perplexed.*

JUDAISM (in part)

S.P.J. S. Paul Johnston (d. 1985). *Director, National Air and Space Museum, Smithsonian Institution, Washington, D.C., 1964–69. Author of Horizons Unlimited and others.*

SIKORSKY, IGOR (Micropædia)

S.R. Sydney Ross. *Emeritus Professor of Chemistry, Rensselaer Polytechnic Institute, Troy, New York. Coauthor of On Physical Adsorption; Colloids and Interfaces.*

PRIESTLEY, JOSEPH (Micropædia)

S.Ra. Sheila Ralphs. *Former Senior Lecturer in Italian, Victoria University of Manchester, England.*

ITALIAN LITERATURE (in part)

S.R.L. Susan R. Larson. *Executive Director, Center for Scandinavian Studies, Minneapolis, Minnesota.*

FINLAND (in part)

S.R.M. S. Roy Meadow. *Professor and Head, Department of Paediatrics and Child Health, St. James's Hospital, University of Leeds, England. Coauthor of The Child and His Symptoms and others.*

CHILDHOOD DISEASES AND DISORDERS (in part)

S.R.S. Stuart Reynolds Schram. *Emeritus Professor of Politics, School of Oriental and African Studies, University of London. Author of The Thought of Mao Tse-tung and others.*

MAO TSE-TUNG

S.R.Se. Stan R. Seagle. *Former Vice President, Research and Technical Development, RMI Titanium Company, Niles, Ohio.*

INDUSTRIES, EXTRACTION AND PROCESSING (in part)

S.R.T. Steven R. Tannenbaum. *Professor of Chemistry and of Toxicology, Massachusetts Institute of Technology, Cambridge. Coeditor of Single-Cell Protein and others.*

FOOD PROCESSING (in part)

S.S. Sergio Sarmiento. *Vice President, Televisión Azteca, Mexico City. Former Editor in Chief, Spanish-language publications, Encyclopædia Britannica Publishers, Inc., Mexico City. Author of Lucubraciones: Ensayos económicos y políticos.*

MEXICO CITY (in part)

S.Sa. Stanley Sadie. *Editor, The New Grove Dictionary of Music and Musicians and companion dictionaries, London. Editor, The Musical Times, 1967–87.*

Music Critic, The Times (London), 1964–81.

MOZART

S.S.A. Stanislas Spero Adotevi. *Director, Institute of Applied Research, Porto-Novo, Benin. Author of Demain la veille.*
WESTERN AFRICA (in part)

S.S.Ch. Sukhdev Singh Chib. *Professor and Head, Geography Department, University of Jammu, India. Author of Nineteen Fateful Months: A Socio-economic Study and others.*
INDIA (in part)

S.S.D.J. S.S.D. Jones (d. 1990). *Navigation consultant. Head, Navigation and Guidance Division, Royal Aircraft Establishment, Farnborough, England. Author of "Recent Developments in Radio Navigation" in Encyclopaedic Dictionary of Physics.*
NAVIGATION (in part)

S.S.F. Sheppard Sunderland Frere. *Emeritus Professor of the Archaeology of the Roman Empire, University of Oxford. Author of Britannia and others.*
UNITED KINGDOM (in part)

S.S.H. Syed Sajjad Husain (deceased). *Professor of English, Umm al-Qura University, Mecca, Saudi Arabia, 1975–85. Vice-Chancellor, University of Rājshāhi, Bangladesh, 1969–71. Author of Descriptive Catalogue of Bengali Manuscripts.*
BANGLADESH (in part)

S.Si. Sinnathurai Sivasubramaniam. *Senior Lecturer in Agronomy, Eastern University, Chenkaladi, Sri Lanka. Project Coordinator, Agricultural Research Project, Tea Research Institute of Sri Lanka, Talawakelle, 1988.*
BEVERAGE PRODUCTION (in part)

S.Sk. Stephan Skalweit. *Emeritus Professor of Modern History, Rheinisch Friedrich Wilhelm University of Bonn, Germany. Author of Frankreich und Friedrich der Grosse and others.*
FREDERICK WILLIAM (BRANDENBURG) (Micropædia)

S.Sm. Stephen Smale. *Professor of Mathematics, University of California, Berkeley. Coeditor of Global Analysis.*
ANALYSIS (IN MATHEMATICS) (in part)

S.Sp. The Rev. Sidney Spencer (deceased). *Minister, Bath and Trowbridge Unitarian Churches, England. Principal of Manchester College, University of Oxford, 1951–56. Author of Mysticism in World Religion.*
CHRISTIANITY (in part)

S.S.P. Samuel S. Perdue. *Freelance science writer.*
IMMUNITY (in part)

S.S.R. Susanne S. Renner. *Professor of Botany, Johannes Gutenberg University of Mainz, Germany. Editor of The Role of Scent Glands in Pollination.*
ANGIOSPERMS (in part)

S.St. Sewell Stokes (d. 1979). *Author and dramatist. Author of Isadora: An Intimate Portrait and others.*
DUNCAN, ISADORA (Micropædia)

S.Su. Sanjay Subrahmanyam. *Reader in Economics, University of Delhi, India. Author of The Political Economy of Commerce: Southern India, 1500–1650.*
INDIA (in part)

S.S.Z. Steven S. Zumdahl. *Professor and Associate Head, Department of Chemistry, University of Illinois at Urbana-Champaign. Author of Chemical Principles and many others.*
CHEMICAL COMPOUNDS (in part)

S.T. Stith Thompson (d. 1976). *Distinguished Service Professor of English and Folklore, Indiana University, Bloomington, 1953–55. Author of Motif-Index of Folk-Literature (6 vol.); The Folktale; and others.*
FOLK ARTS (in part)

St.C. Steven Chu. *Theodore and Frances Geballe Professor of Physics and Applied Physics, Stanford University, California.*
ANALYSIS AND MEASUREMENT, PHYSICAL AND CHEMICAL (in part)

St.H. Staffan Helmfrid. *Professor of Human Geography, Stockholm University, Sweden. Scientific editor of National Atlas of Sweden (17 vol.).*
SWEDEN (in part)

S.V.A. Stanley Victor Anderson. *Emeritus Professor of Political Science, University of California, Santa Barbara. Author of The Nordic Council.*
DENMARK (in part)

S.V.G. Stephen Vincent Grancsay (d. 1980). *Curator of Arms and Armor, Metropolitan Museum of Art, New York City, 1929–64. Author of classic studies on arms and metalwork.*
DECORATIVE ARTS AND FURNISHINGS (in part)

S.V.L.N.P. Sarma V.L.N. Pisupati. *Research Associate in Fuel Science; Associate Director for Research Operations, Combustion Laboratory, Pennsylvania State University, University Park. Coauthor of Combustion of Anthracite/Bituminous Coal Blends for Utility Stoker Plants.*
INDUSTRIES, EXTRACTION AND PROCESSING (in part)

S.V.W. Sudhir Vyankatesh Wanmali. *Director, Outreach Division, International Food Policy Research Institute, Washington, D.C. Author of Periodic Markets and Rural Development in India.*
INDIA (in part)

S.W.B. Salo Wittmayer Baron (d. 1989). *Professor of Jewish History, Literature, and Institutions, Columbia University, 1930–63. Author of A Social and Religious History of the Jews.*
JUDAISM (in part)

S.We. Stanley Weintraub. *Evan Pugh Professor of Arts and Humanities, Pennsylvania State University, University Park. Author of Private Shaw and Public Shaw: A Dual Portrait of Lawrence of Arabia and G.B.S.; coauthor of Lawrence of Arabia: The Literary Impulse.*
LAWRENCE, T.E. (in part) (Micropædia)
SHAW, GEORGE BERNARD (in part) (Micropædia)

S.W.F. Sidney W. Fox. *Distinguished Research Scientist, Department of Marine Sciences, University of South Alabama, Mobile. Research Professor and Director, Institute for Molecular and Cellular Evolution, University of Miami, Coral Gables, Florida, 1964–89. Coauthor of Molecular Evolution and the Origin of Life.*
OPARIN, ALEKSANDR IVANOVICH (Micropædia)

S.W.Fi. Shirley W. Fischler. *Adjunct Lecturer in Journalism, Columbia University. Coauthor of The Hockey Encyclopedia; Everybody's Hockey Book.*
SPORTS, MAJOR TEAM AND INDIVIDUAL (in part)

S.W.J. Stanley W. Jacob, M.D. *Gerlinger Professor of Surgery, Oregon Health Sciences University, Portland. Author of Structure and Function in Man.*
CIRCULATION AND CIRCULATORY SYSTEMS (in part)

S.W.K.M. Stephen William Kenneth Morgan. *Former Managing Director, Imperial Smelting Processes Limited, Avonmouth, England.*
CHEMICAL ELEMENTS (in part)

S.W.S. Steven W. Squyres. *Professor of Astronomy, Cornell University, Ithaca, New York.*
SOLAR SYSTEM, THE (in part)

S.-y.H. Shan-yüan Hsieh. *Former Assistant Professor of Philosophy, Haverford (Pennsylvania) College.*
TSENG KUO-FAN (in part) (Micropædia)

S.Z.L. Sid Z. Leiman. *Professor of Jewish History and Literature; Chairman, Department of Judaic Studies, Brooklyn College, City University of New York.*
BA'AL SHEM TOV (in part) (Micropædia)
JUDAISM (in part)

T.A.K. Thomas A. Kochan. *Professor of Industrial Relations, Massachusetts Institute of Technology, Cambridge. Coauthor of The Transformation of American Industrial Relations.*
WORK AND EMPLOYMENT (in part)

T.A.S. Thomas A. Schafer. *Emeritus Professor of Church History, McCormick Theological Seminary, Chicago.*
EDWARDS, JONATHAN (Micropædia)

T.A.Sa. Tilde A. Sankovitch. *Harold H. and Virginia Anderson Professor of French and Italian, Northwestern University, Evanston, Illinois. Author of French Women Writers and the Book and others.*
ANTWERP (in part)
MONTAIGNE

T.A.W. Thomas A. Williams. *Professor of Management Science, Rochester (New York) Institute of Technology. Coauthor of Introduction to Statistics: Concepts and Applications and others.*
STATISTICS (in part)

T.B.C. Thomas B. Cochran. *Senior Scientist and Director of the Nuclear Program, Natural Resources Defense Council, Inc., Washington, D.C. Coauthor and coeditor of Nuclear Weapons Databook (vol. 1–4).*
WAR, THE TECHNOLOGY OF (in part)

T.B.H. Thomas B. Hinton (d. 1976). *Associate Professor of Anthropology, University of Arizona, Tucson. Author of A Survey of Indian Assimilation in Eastern Sonora.*

AMERICAN PEOPLES, NATIVE (in part)

T.B.S. Theodore B. Schwartz, M.D. *Clinical Professor of Medicine, University of Washington, Seattle. Editor, Year Book of Endocrinology, 1964–86.*

ENDOCRINE SYSTEMS (in part)

T.B.T. Terence Barrington Thomas. *Director, Gladding International Ltd. Angling correspondent, The Field, and others. Presenter of "Angling Today," Associated Television, Birmingham, England. Author of Casting.*

FISHING (in part) (Micropædia)

T.C. Theresa Clay. *Former Senior Principal Scientific Officer, Department of Entomology, British Museum (Natural History), London.*

INSECTS (in part)

T.C.C. Timothy C. Champion. *Professor of Archaeology, University of Southampton, England. Coauthor of Prehistoric Europe.*

EUROPEAN HISTORY AND CULTURE (in part)

T.C.M. Terence Croft Mitchell. *Keeper, Department of Western Asiatic Antiquities, British Museum, London, 1985–89.*

HISTORY, THE STUDY OF (in part)

T.C.McC. T.C. McCaskie. *Senior Lecturer in the Social History of West Africa, University of Birmingham, England.*

WESTERN AFRICA (in part)

T.C.O. Tobias Chant Owen. *Professor of Astronomy, University of Hawaii at Manoa, Honolulu. Coauthor of The Planetary System and others.*

SOLAR SYSTEM, THE (in part)

T.C.P. Thomas C. Patterson. *Professor of Anthropology and History, Temple University, Philadelphia. Author of The Inca Empire and others.*

PRE-COLUMBIAN CIVILIZATIONS (in part)

T.Cr. The Rev. Theodore Crowley, O.F.M. (d. 1990). *Professor of Scholastic Philosophy, Queen's University of Belfast, Northern Ireland. Author of Roger Bacon: The Problem of the Soul in His Philosophical Commentaries.*

BACON, ROGER (in part) (Micropædia)

T.C.R. Thomas C. Reeves. *Professor of History, University of Wisconsin, Parkside. Author of Freedom and the Foundation: The Fund for the Republic in the Era of McCarthyism and others.*

EISENHOWER, DWIGHT D. (Micropædia)

T.C.S. Thomas Clark Shedd. *Editorial Director, Modern Railroads, Chicago.*

TRANSPORTATION (in part)

T.C.W. T. Carroll Wilson. *Historian and Archivist, Hills Bros. Coffee, Inc., San Francisco, 1924–66; Director, 1964–68; Vice President, 1945–66. Author of The Art of Coffee Making.*

BEVERAGE PRODUCTION (in part)

T.C.Y., Jr. T. Cuyler Young, Jr. *Curator, West Asian Department, Royal Ontario Museum, Toronto. Professor of Near Eastern Studies, University of Toronto.*

Author of "A Comparative Ceramic Chronology for Western Iran, 1500–500 B.C." in Iran.

IRAN (in part)

T.D. Theodosius Dobzhansky (d. 1975). *Professor of Biology, Rockefeller University, New York City, 1962–71. Adjunct Professor of Genetics, University of California, Davis, 1971–75. Author of Mankind Evolving; Genetics of the Evolutionary Process; and numerous papers on evolutionary genetics.*

GENETICS AND HEREDITY, THE PRINCIPLES OF (in part)

T.d.A. The Rev. Tarsicio de Azcona. *Emeritus Professor of Church History, University of Navarre, Pamplona, Spain. Author of Isabel la Católica.*

FERDINAND II (SPAIN: ARAGON) (Micropædia)

T.De. T. Delevoryas. *Professor of Botany, University of Texas at Austin. Author of Morphology and Evolution of Fossil Plants.*

GYMNOSPERMS (in part)

T.E.A. Thomas Edward Allibone. *External Professor Emeritus of Electrical Engineering, University of Leeds, England. Robert Kitchin Research Professor of Physics, City University, London. Director, Research Laboratory, Associated Electrical Industries, Aldermaston, England, 1946–63. Author of The Release and Use of Nuclear Energy and others.*

RUTHERFORD

T.E.Ar. Terence Edward Armstrong (d. 1996). *Reader in Arctic Studies, Scott Polar Research Institute, University of Cambridge, 1977–83. Coauthor of The Circumpolar North.*

ARCTIC, THE (in part)

T.E.F. Thomas E. Faber. *Lecturer in Physics, University of Cambridge, 1959–93; Fellow of Corpus Christi College, Cambridge. Author of Fluid Dynamics for Physicists and others.*

MECHANICS (in part)

T.E.G. T.E. Gudava (deceased). *Professor of Linguistics, Tbilisi State University, Georgian S.S.R.*

LANGUAGES OF THE WORLD (in part)

T.E.Je. Thomas Edmund Jessop (d. 1980). *Ferens Professor of Philosophy, University of Hull, England, 1928–61. Editor of Bibliography of David Hume and of Scottish Philosophy.*

HUME (in part)

Te.K. Terrence Kaufman. *Professor of Anthropology and Linguistics, University of Pittsburgh, Pennsylvania. Coauthor of Language Contact, Creolization, and Genetic Linguistics.*

LANGUAGES OF THE WORLD (in part)

T.E.K. Thomas Edward Keys. *Emeritus Professor of the History of Medicine, Mayo Graduate School of Medicine, University of Minnesota, Rochester. Emeritus Librarian, Mayo Foundation. Author of The History of Surgical Anesthesia and others.*

MAYO FAMILY (in part) (Micropædia)

T.E.Kr. Thomas Edvard Krogh. *Director, Geochronology Laboratory, Royal Ontario Museum, Toronto.*

GEOCHRONOLOGY (in part)

T.E.O'T. Thomas E. O'Toole. *Professor of Sociology and Anthropology, St. Cloud State University, Minnesota. Author of Historical Dictionary of Guinea; Central African Republic: The Continent's Hidden Heart.*

CENTRAL AFRICA (in part)

WESTERN AFRICA (in part)

T.F.B. Thomas F. Budinger, M.D. *Professor of Research Medicine, Donner Laboratory, Lawrence Berkeley Laboratory; Professor of Biinstrumentation, University of California, Berkeley. Operations Officer, International Ice Patrol, 1959–60.*

ICE AND ICE FORMATIONS (in part)

T.F.F. Timothy Fridtjof Flannery. *Senior Research Scientist, Mammal Section, Australian Museum, Sydney. Author of Mammals of the South-West and Moluccan Islands and others.*

BIOSPHERE AND CONCEPTS OF ECOLOGY, THE (in part)

T.F.M. Thomas F. Madden. *Associate Professor of History, St. Louis University, Missouri. Author of A Concise History of the Crusades; coauthor of The Fourth Crusade: The Conquest of Constantinople.*

CRUSADES (in part)

T.F.McG. Thomas F. McGann (d. 1982). *Professor of History, University of Texas at Austin. Author of Argentina, the Divided Land; Argentina, the United States, and the Inter-American System, 1880–1914.*

PERÓN, JUAN (in part) (Micropædia)

T.F.T. Thomas Frederick Tout (d. 1929). *President, Royal Historical Society, 1925–28. Professor of History, Victoria University of Manchester, England, 1890–1925. Author of Edward the First; The Place of the Reign of Edward II in English History; and others.*

EDWARD III (ENGLAND AND GREAT BRITAIN) (in part) (Micropædia)

T.F.To. Thomas Forsyth Torrance. *Emeritus Professor of Christian Dogmatics, University of Edinburgh. Author of Karl Barth: An Introduction to His Early Theology, 1910–1931 and many others.*

BARTH, KARL (Micropædia)

T.G. Sir Tyrone Guthrie (d. 1971). *Theatrical director. Chancellor, Queen's University of Belfast, Northern Ireland, 1963–70. Author of A Life in the Theatre; New Theatre; and others.*

THEATRE, THE ART OF THE (in part)

T.G.B. Thomas G. Benedek, M.D. *Professor of Medicine. Adjunct Professor of History, University of Pittsburgh, Pennsylvania. Former Chief, Outpatient Department and Rheumatology Section, Veterans Administration Hospital, Pittsburgh.*

SUPPORTIVE AND CONNECTIVE TISSUES (in part)

T.G.H.J. Thomas Garnet Henry James. *Former Keeper, Department of Egyptian Antiquities, British Museum, London. Editor of The Hekanakhte Papers, and Other Middle Kingdom Documents.*

EGYPTIAN ARTS AND ARCHITECTURE, ANCIENT

T.G.Ms. Thomas G. Mathews. *Former Secretary-General, Association of Caribbean Universities and Research Institutes, San Juan, Puerto Rico. Research Professor of History, University of Puerto Rico, 1969–80. Author of Puerto Rican Politics and the New Deal.*
WEST INDIES, THE (in part)

T.G.P.S. T.G. Percival Spear (d. 1982). *Fellow of Selwyn College, Cambridge; Lecturer in History, University of Cambridge, 1963–69. Author of India: A Modern History and others; coauthor and editor of Oxford History of India (3rd ed.).*
AURANGZEB (Micropædia)
BĀBUR (Micropædia)
CLIVE, ROBERT, 1ST BARON CLIVE OF PLASSEY (Micropædia)
INDIA (in part)

T.Gr. Theodore C. Grame. *Author of Folk Music; America's Ethnic Music; and others.*
MUSICAL INSTRUMENTS (in part)

T.H. Thomas Hauser. *Author of The Black Lights: Inside the World of Professional Boxing; Muhammad Ali: His Life and Times.*
ALI, MUHAMMAD (in part) (Micropædia)
BOXING (in part)

Th.B. Thomas J. Bernard. *Professor, Criminal Justice and Sociology, Pennsylvania State University, University Park. Coauthor of Theoretical Criminology.*
CRIME AND PUNISHMENT (in part)

T.H.C. Theodore Hsi-en Chen (d. 1991). *Professor of Education and Asian Studies, University of Southern California, Los Angeles, 1938–74. Author of The Maoist Educational Revolution.*
EDUCATION, HISTORY OF (in part)

T.H.D. Tulio Halperin Donghi. *Professor of History, University of California, Berkeley. Author of Historia contemporánea de América Latina.*
ARGENTINA (in part)

T.H.E. Thomas H. Everett (d. 1986). *Director of Horticulture, New York Botanical Garden, Bronx. Author of Living Trees of the World.*
TREES (in part)

T.H.El. Thomas Henry Elkins (d. 1995). *Professor of Geography, University of Sussex, Brighton, England. Author of Germany and others.*
FRANCE (in part)
GERMANY (in part)

T.H.G. Theodor H. Gaster (d. 1992). *Professor of Religion, Barnard College, Columbia University, 1966–72. Author of Myth, Legend, and Custom in the Old Testament.*
JUDAISM (in part)

Th.H. Thor Heyerdahl. *Explorer, anthropologist, writer, and lecturer. Organizer and leader of Norwegian Archaeological Expedition to Easter Island and the East Pacific, 1955–56, and many other expeditions. Author of Aku-Aku: The Secret of Easter Island; The Kon-Tiki Expedition; and others.*
PACIFIC ISLANDS (in part)

Th.Ho. Thomas Howarth. *Emeritus Professor of Architecture, University of Toronto.*
TORONTO

Th.M. Thomas Munro (d. 1974). *Curator of Education, Cleveland (Ohio) Museum of Art, 1931–67. Professor of Art, Case Western Reserve University, Cleveland. Author of The Arts and Their Interrelations and others.*
AESTHETICS (in part)

T.Ho. Thomas Hodgkin (d. 1982). *Writer. Fellow of Balliol College, Oxford; Lecturer in the Government of New States, University of Oxford, 1965–70. Author of Nationalism in Colonial Africa and others.*
USMAN DAN FODIO (Micropædia)
T.Hor. Theodore Hornberger (d. 1975). *John Welsh Centennial Professor of History and English Literature, University of Pennsylvania, Philadelphia, 1968–75. Author of Benjamin Franklin.*
FRANKLIN (in part)

T.H.v.A. Tjeerd H. van Andel. *Wayne Loel Professor Emeritus of Earth Sciences, Stanford University, California. Honorary Professor of Earth History, University of Cambridge. Author of New Views on an Old Planet: Continental Drift and the History of the Earth.*
PLATE TECTONICS

Th.V.G. Thomas V. Gamkrelidze. *Director, Oriental Institute, Georgian Academy of Sciences, Tbilisi. Author of Alphabetic Writing and the Old Georgian Script and others.*
LANGUAGES OF THE WORLD (in part)

T.Hy. Takao Hayashi. *Professor of History of Science, Doshisha University, Kyōto, Japan.*
BHASKARA I (Micropædia)

T.I. Toshihiko Izutsu (d. 1993). *Professor of Islāmic Studies, McGill University, Montreal, 1969–75. Author of A Comparative Study of the Key Philosophical Concepts in Sufism and Taoism.*
IBN AL'ARABI (Micropædia)

T.Ic. Takashi Ichiye. *Emeritus Professor of Oceanography, Texas A&M University, College Station.*
EKMEN, V. WALFRID (Micropædia)

T.In. Tim Ingold. *Max Gluckman Professor of Social Anthropology, Victoria University of Manchester, England. Author of Hunters, Pastoralists, and Ranchers and others.*
ARCTIC, THE (in part)

T.Io. Teiji Ichiko. *Former Director General, National Institute of Japanese Literature, Tokyo. Author of History of Japanese Literature and others.*
LITERATURE, THE ART OF (in part)

T.J. Thorkild Jacobsen (d. 1993). *Professor of Assyriology, Harvard University, 1962–74. Author of The Sumerian Kinglist and others.*
MIDDLE EASTERN RELIGIONS, ANCIENT (in part)

T.J.B. Trent J. Bertrand. *Senior Economist, International Bank for*

Reconstruction and Development, Washington, D.C. Former Professor of Economics, State University of New York at Binghamton.

INTERNATIONAL TRADE (in part)

T.J.Br. T. Julian Brown (d. 1987). *Professor of Palaeography, University of London, 1961–84. Coauthor of Codex Lindisfarnensis.*
WRITING (in part)

T.J.C. Theodore John Cadoux. *Former Senior Lecturer in Ancient History, University of Edinburgh.*
CIMON (Micropædia)
SOLON (in part) (Micropædia)

T.J.Co. Timothy John Connell. *Principal Lecturer in Hispanic Studies, Ealing College of Higher Education, London. Coauthor of Spain after Franco and others.*
BARCELONA
MADRID (in part)

T.J.H. Theo Jozef Hermans. *Professor of Dutch and Comparative Literature, University College, University of London. Author of The Structure of Modernist Poetry; editor of The Flemish Movement: A Documentary History 1780–1990.*
BELGIAN LITERATURE (in part)
BRUSSELS (in part)

T.Jo. Thomas Jones (d. 1972). *Professor of Welsh Language and Literature, University College of Wales, Aberystwyth, University of Wales, 1952–70. Editor of Brut y Tywysogion.*
CELTIC LITERATURE (in part)

T.J.S. Terry J. Scheffer. *Chief Scientist, Motif Incorporated (flat-panel displays), Wilsonville, Oregon.*
ELECTRONICS (in part)

T.K.B. T. Keilor Bentley. *Director, Owens Art Gallery, Mount Allison University, Sackville, New Brunswick, 1976–89. Superintendent, Alexander Graham Bell Museum, Baddeck, Nova Scotia, 1959–64.*
BELL, ALEXANDER GRAHAM (Micropædia)

T.K.F. Thea K. Flaum. *President, Thea Flaum Productions Ltd. (television and film), Chicago. Former Editor, Urban Research Corporation, Chicago.*
UNITED STATES OF AMERICA (in part)

T.Kh. Tarif Khalidi. *Professor of History and Archaeology, American University of Beirut, Lebanon.*

'ABD AL-MALIK (Micropædia)

'ABD AR-RAHMĀN III (Micropædia)

T.Kl. Tibor Klaniczay (d. 1992). *Director, Institute of Literary Studies, Hungarian Academy of Sciences, Budapest, 1984–92.*
HUNGARIAN LITERATURE (in part)

T.Ku. Tadachika Kuwata. *Emeritus Professor of Japanese History, Kokugakuin University, Tokyo. Author of Toyotomi Hideyoshi and others.*
TOYOTOMI HIDEYOSHI (Micropædia)

T.K.Z. Tatyana Konstantinovna Zakharova. *Former Senior Science Editor, Sovetskaya entsiklopediya (publishing house).*
ASIA (in part)

T.L.K. Thomas L. Karnes. *Emeritus Professor of History, Arizona State University, Tempe. Author of Failure of Union: Central America, 1824–1975 and others.*

CENTRAL AMERICA (in part)

T.L.L. Thomas L. Lentz, M.D. *Professor of Cell Biology, School of Medicine, Yale University. Author of Primitive Nervous Systems.*

NERVES AND NERVOUS SYSTEMS (in part)

T.L.Pe. Troy L. Péwé. *Emeritus Professor of Geology, Arizona State University, Tempe. President, International Permafrost Association, 1988–93. Authority on the geomorphology of polar regions. Editor of The Periglacial Environment: Past and Present.*

ICE AND ICE FORMATIONS (in part)

T.M.A. Tom M. Apostol. *Emeritus Professor of Mathematics, California Institute of Technology, Pasadena. Author of Introduction to Analytic Number Theory and others.*

NUMBER THEORY (in part)

T.M.B. Thomas M. Barker. *Emeritus Professor of History, State University of New York at Albany. Author of Social Revolutionaries and Secret Agents: Carinthian Slovene Partisans and Britain's Special Operations Executive and others.*

BALKAN STATES (in part)

T.M.D. Thomas M. Davies, Jr. *Professor of History; Chairman of Latin American Studies; Director, Center for Latin American Studies, San Diego State University, California. Author of Indian Integration in Peru: A Half Century of Experience, 1900–1948.*

PERU (in part)

T.M.K. Sir T. Malcolm Knox (d. 1980). *Principal of the University of St. Andrews, Scotland, 1953–66. Translator of Hegel's Political Writings, Early Theological Writings, and Aesthetics.*

HEGELIANISM, HEGEL AND (in part)

T.Mo. Therald Moeller. *Emeritus Professor of Chemistry, Arizona State University, Tempe. Author of Inorganic Chemistry: A Modern Introduction.*

CHEMICAL ELEMENTS (in part)

T.M.P. Thomas M. Poulsen. *Emeritus Professor of Geography, Portland State University, Oregon. Author of Nations and States: A Geographic Background to World Affairs.*

BALKAN STATES (in part)

EUROPE (in part)

T.N.B. T.N. Bisson. *Henry Charles Lea Professor of Medieval History, Harvard University. Author of The Medieval Crown of Aragon and others.*

FRANCE (in part)

T.N.M. T.N. Madan. *Emeritus Professor of Sociology, Institute of Economic Growth, University of Delhi, India. Author of Modern Myths, Locked Minds: Secularism and Fundamentalism in India and others.*

CASTE (Micropædia)

T.O.M. Thomas Ollive Mabbott (d. 1968). *Professor of English, Hunter College, City University of New York,*

1946–66. Editor of Complete Works of Poe.

POE, EDGAR ALLAN (in part) (Micropædia)

T.O.Ma. Thomas O. Mason. *Professor of Materials Science and Engineering, Northwestern University, Evanston, Illinois. Coeditor of Symposium on Point Defects and Related Properties of Ceramics and others.*

INDUSTRIAL CERAMICS

T.O'R. Tarlach O'Riagain (deceased). *Chairman, Cultural Relations Committee, Dublin. Editor of Genealogical Tracts I.*

PATRICK, SAINT (Micropædia)

T.O.S. Thomas O. Sloane. *Emeritus Professor of Rhetoric, University of California, Berkeley. Author of Donne, Milton, and the End of Humanist Rhetoric.*

RHETORIC (in part)

T.P. Tatiana Proskouriakoff (d. 1985). *Curator of Maya Art, Peabody Museum, Harvard University. Staff member, Carnegie Institution of Washington, D.C., 1939–58. Author of An Album of Maya Architecture.*

CALENDAR (in part)

T.P.A. Thomas P. Anderson. *Connecticut State University Professor of History, Eastern Connecticut State University, Willimantic. Author of Politics in Central America and others.*

CENTRAL AMERICA (in part)

T.Po. Tom Pocock. *Special writer, Evening Standard (London), 1982–88; Defense Correspondent, 1960–73; Travel Editor, 1973–82. Author of Nelson and His World and others.*

NELSON, HORATIO NELSON, VISCOUNT (in part) (Micropædia)

T.P.v.B. Theodorus P. van Baaren (d. 1989). *Professor of Science of Religions, State University of Groningen, The Netherlands. Author of Menschen wie wir and others.*

DOCTRINES AND DOGMAS, RELIGIOUS (in part)

RELIGIOUS AND SPIRITUAL BELIEF, SYSTEMS OF (in part)

T.R.L. Thomas R. Leinbach. *Professor of Geography, University of Kentucky, Lexington. Coauthor of Development and Environment in Malaysia; Southeast Asian Transport: Issues in Development.*

ASIA (in part)

INDONESIA (in part)

SOUTHEAST ASIA (in part)

T.R.T. Thomas R. Tregear (deceased). *Warden, Woodbrooke College, Selly Oak, Birmingham, England, 1959–63. Lecturer in Geography, University of Hong Kong, 1951–59. Author of A Geography of China and others.*

CHINA (in part)

T.S. Tadao Sato. *Writer. Chairman, Japan Film P.E.N. Club. Author of Kurosawa Akira no sekai and others.*

KUROSAWA AKIRA (Micropædia)

T.Sa. Taro Sakamoto (d. 1987). *Historian. Professor, University of Tokyo. Author of History of Japan and others.*

JAPAN (in part)

T.S.Bu. Thomas S. Buechner. *Artist. President, Corning Museum of Glass, Corning, New York, 1971–87; Director, 1951–60. Chairman, Corning Glass Works Foundation and Steuben Glass, Inc., 1971–86. Author of Guide to the Collections of the Corning Museum of Glass and others.*

DECORATIVE ARTS AND FURNISHINGS (in part)

T.S.H. Theodore S. Hamerow. *Emeritus Professor of History, University of Wisconsin, Madison. Author of The Social Foundations of German Unification, 1858–71 and others.*

GERMANY (in part)

T.S.McL. Thomas S. McLeod. *Former Director of Design Technology, Plessey Company Ltd., Ilford, England. Author of Management of Research Development and Design in Industry.*

INDUSTRIAL ENGINEERING AND PRODUCTION MANAGEMENT (in part)

T.Sp. Terence John Bew Spencer (d. 1978). *Professor of English Language and Literature, 1958–78; Director, Shakespeare Institute, 1961–78, University of Birmingham, England. General Editor, The New Penguin Shakespeare and the Penguin Shakespeare Library, 1964–78. Author of The Tyranny of Shakespeare; Shakespeare: The Roman Plays.*

SHAKESPEARE (in part)

T.T. Takeshi Toyoda. *Historian. Professor, Tohoku University, Sendai, Japan, and Hōsei University, Tokyo.*

Author of A History of Pre-Meiji Commerce in Japan and others.

JAPAN (in part)

T.-t.C. Tse-tsung Chow. *Professor of East Asian Languages, Literature, and History, University of Wisconsin, Madison. Author of The May Fourth Movement: Intellectual Revolution in Modern China and others.*

CHEN DUXIU (Micropædia)

T.T.R. Tamara Talbot Rice (d. 1993). *Art historian. Author of Ancient Arts of Central Asia; The Scythians; Russian Art; and others.*

CENTRAL ASIAN ARTS (in part)

T.V.W. Turrell V. Wylie (d. 1984). *Professor of Tibetan Studies, University of Washington, Seattle, 1972–84. Author of The Geography of Tibet According to the 'Dzam-gling-rgyas-bshad.*

CENTRAL ASIAN ARTS (in part)

CHINA (in part)

T.W. Thomas M. Woodard. *Writer and researcher. Instructor in Classics, Princeton University, 1962–64. Editor of Sophocles: A Collection of Critical Essays.*

GREEK DRAMATISTS, THE CLASSICAL (in part)

T.W.B. Thomas W. Burns, M.D. *Distinguished Professor Emeritus of Medicine, University of Missouri, Columbia; former Director, Division of Endocrinology and Metabolism. Author of Endocrine Lecture Syllabus.*

ENDOCRINE SYSTEMS (in part)

T.W.D.S. Tsepon W.D. Shakabpa (d. 1989). *Historian. Minister of Finance, Tibet, 1939–51. Chief Representative of the*

Dalai Lama to the Government of India, 1959–66. Author of Tibet: A Political History.

CHINA (*in part*)

T.We. Thomas Weigend. *Professor of Law, University of Cologne, Germany. Author of "Criminal Procedure: Comparative Aspects" in Encyclopedia of Crime and Justice.*

PROCEDURAL LAW (*in part*)

T.W.-m. Tu Wei-ming. *Professor of Chinese History and Philosophy, Harvard University. Author of Confucian Thought: Selfhood as Creative Transformation and others.*

CONFUCIANISM, CONFUCIUS AND

T.W.Wa. Thomas W. Walker. *Professor of Political Science; Director, Latin American Studies, Ohio University, Athens. Author of Nicaragua: The Land of Sandino and others.*

CENTRAL AMERICA (*in part*)

T.W.Y. Thomas W. Young. *Senior Lecturer in Biochemistry, University of Birmingham, England. Coauthor of Malting and Brewing Science.*

BEVERAGE PRODUCTION (*in part*)

T.-y.L. Tien-yi Li. *Merston Professor Emeritus of Chinese Literature and History, Ohio State University, Columbus. Editor of Readings in Contemporary Chinese Literature; Chinese Historical Literature.*

CHINESE LITERATURE (*in part*)

T.Y.S. Tatyana Yosifovna Supranovich. *Former Senior Scientist and Head, Division of Sea Dynamics, Far Eastern Hydrometeorological Research Institute, Vladivostok, Russia.*

PACIFIC OCEAN, THE (*in part*)

U.A.U. Urho A. Uotila. *Emeritus Professor of Geodesy, Ohio State University, Columbus.*

EARTH, THE (*in part*)

U.B. Ugo Bianchi. *Professor of the History of Religions, University of Rome. Author of Il dualismo religioso; editor of The Origins of Gnosticism.*

RELIGIONS AND SPIRITUAL BELIEF, SYSTEMS OF (*in part*)

U.Be. Ulli Beier. *Director, Iwalewa House Centre for Contemporary Arts from Africa and the Third World, University of Bayreuth, Germany, 1981–84; 1989–96. Research Professor and Director, Institute of African Studies, University of Ife, Ile-Ife, Nigeria, 1971–74. Founder of Black Orpheus. Author of African Poetry and others; editor of Introduction to African Literature.*

AFRICAN ARTS (*in part*)

U.Bo. Umberto Bosco (d. 1987). *Professor of Italian Language and Literature, University of Rome, 1946–75. Director, Enciclopedia italiana. Editor of Boccaccio's Decameron and others.*

BOCCACCIO, GIOVANNI (*in part*)

(Micropædia)

U.M. Umberto Marcelli. *Former Lecturer in History, University of Bologna, Italy. Author of Cavour diplomatico.*

CAVOUR, CAMILLO BENSO, CONTE DI (*in part*)
(Micropædia)

U.M.D. Ulrich M. Drobni. *Director, Max Planck Institute for Foreign Private and Private International Law, Hamburg, Germany. Professor of Law, University of Hamburg. Author of American-German Private International Law and others.*

BUSINESS LAW (*in part*)

PROCEDURAL LAW (*in part*)

U.M.S. Ulric M. Spencer. *Economic Statistician, National Economic Development Office, London. Coauthor of Profit and Personality in Retailing.*

UNITED KINGDOM (*in part*)

U.P.B. Ulick Peter Burke. *Professor of Cultural History, University of Cambridge; Fellow of Emmanuel College, Cambridge. Author of The Renaissance Sense of the Past and others.*

VALLA, LORENZO (Micropædia)

U.P.S. Umakant Premanand Shah (d. 1988). *Deputy Director, Oriental Institute, Maharaja Sayajirao University of Baroda, India. Author of Studies in Jaina Art: Akota Bronzes.*

JAINISM

MAHĀVĪRA (*in part*) (Micropædia)

U.-R.B. Uta-Renate Blumenthal. *Professor of History, The Catholic University of America. Author of The Investiture Controversy: Church and Monarchy from the Ninth to the Twelfth Century; The Early Councils of Pope Paschal II.*

GREGORIAN REFORM (Micropædia)

V.A. Vernon Ahmadjian. *Professor of Biology, Clark University, Worcester, Massachusetts. Author of The Lichen Symbiosis; coeditor of The Lichens.*

FUNGI (*in part*)

Va.K. Valdimar Kristinsson. *Editor, Fjarmalatidindi (Financial Times), Central Bank of Iceland, Reykjavík.*

ICELAND (*in part*)

V.Al. Victor Alba. *Emeritus Professor of Political Science, Kent State University, Ohio. Author of The Mexicans and others.*

ZAPATA, EMILIANO (Micropædia)

V.A.R. Victor A. Ramos. *Professor of Geology, University of Buenos Aires, Argentina. Author of "The Birth of Southern South America" in American Scientist and other articles.*

SOUTH AMERICA (*in part*)

V.A.U. Victor Andrade U. *Minister of Foreign Affairs of Bolivia, 1958–60. Ambassador of Bolivia to the U.S., 1944–46; 1952–58; 1960–62. Author of Problemas sociales de Bolivia and others.*

BOLIVIA (*in part*)

V.B. Victor Barna (d. 1972). *World table tennis champion, men's singles, 1930, 1932–35; men's doubles, 1929–35; mixed doubles, 1932, 1935. Author of Table Tennis Today.*

TABLE TENNIS (*in part*) (Micropædia)

V.Bi. Victor J.P. Biel. *Attorney at Law, Luxembourg. Author of numerous articles on law.*

LUXEMBOURG (*in part*)

V.Br. Victor Brombert. *Henry Putnam University Professor of Romance and Comparative Literature, Princeton University. Editor of Stendhal: A Collection of Critical Essays.*

STENDHAL (Micropædia)

V.B.W. Sir Vincent Brian Wigglesworth (d. 1994). *Professor of Biology, University of Cambridge, 1952–66; Director, Agricultural Research Council Unit of Insect Physiology, 1943–67. Author of The Principles of Insect Physiology; The Life of Insects.*

INSECTS (*in part*)

V.B.Z. Viktor Borisovich Zhmuida. *Former Head, Central Asian Section, Council for Research on Productive Forces, U.S.S.R. Planning Committee, Moscow. Author of numerous publications on Turkmen S.S.R.*

CENTRAL ASIA (*in part*)

V.C. Vincent Cronin. *Freelance writer. Author of The Flowering of the Renaissance and others.*

SARPI, PAOLO (Micropædia)

V.C.F. Victor C. Falkenheim. *Associate Professor and Chairman, Department of East Asian Studies, University of Toronto. Editor of Citizens and Groups in Contemporary China.*

CHINA (*in part*)

V.C.M. Virginia C. Maiorana. *Research Associate, Department of Ecology and Evolution, University of Chicago.*

ANIMALS (*in part*)

V.D. Vilmos Diószegi (d. 1971). *Research Fellow, Hungarian Academy of Sciences, Budapest. Author of Tracing Shamans in Siberia; editor of Popular Beliefs and Folklore Tradition in Siberia.*

SACRED OFFICES AND ORDERS (*in part*)

V.D.S. Vicki D. Sebela. *Freelance writer. Former Executive Administrator, Social Engineering Associates, Inc., Chicago.*

UNITED STATES OF AMERICA (*in part*)

V.E.I. Verity Elizabeth Irvine. *Writer and researcher.*

ARABIA (*in part*)

JORDAN (*in part*)

SYRIA (*in part*)

V.F.K. Viktor Filipovich Kanayev. *Former Senior Scientist, Moscow M.V. Lomonosov State University. Coauthor of Reléf dna Indiiskogo okeana and others.*

INDIAN OCEAN, THE (*in part*)

V.G. Viktor Gutmann. *Emeritus Professor of Inorganic Chemistry, Technical University of Vienna. Author of Halogen Chemistry and others.*

CHEMICAL ELEMENTS (*in part*)

V.G.N. Viktor Grigoryevich Neyman. *Deputy Head, Department of Oceanology, Atmospheric Physics, and Geography, Russian Academy of Sciences, Moscow. Author of several articles on oceanology.*

INDIAN OCEAN, THE (*in part*)

V.I.J.F. Valerie I.J. Flint. *G.F. Grant Professor of History, University of Hull, England. Author of The Imaginative*

Landscape of Christopher Columbus and others.

COLUMBUS

V.I.S. Victor Ilyich Seroff (d. 1979). *Writer. Author of Rachmaninoff.*

RACHMANINOFF, SERGEY (Micropædia)

V.J. Valerie Jenness. *Professor and Chair, Department of Criminology, University of California, Irvine. Coauthor of Making Hate a Crime: From Social Movement to Law Enforcement.*

HATE CRIME (Micropædia)

V.J.M. Vytautas J. Mažiulis. *Professor of Baltic Languages, Vilnius (Lithuania) University.*

LANGUAGES OF THE WORLD (in part)

V.J.P. V.J. Parry (d. 1974). *Reader in the History of the Near and Middle East, School of Oriental and African Studies, University of London. Contributor to The New Cambridge Modern History; Encyclopædia of Islam.*

BAYEZID II (Micropædia)

SÜLEYMAN I (Micropædia)

V.J.T. Vello Julius Tarmisto (d. 1991). *Director, Institute of Economics, Estonian S.S.R. Academy of Sciences, Tallinn, 1974–84. Coauthor of Estonian S.S.R.*

BALTIC STATES (in part)

V.L. Véronique Lambert. *Assistant, Department of Medieval History, State University of Ghent, Belgium.*

LUXEMBOURG (in part)

V.Lo. Victor Lowe (d. 1988). *Professor of Philosophy, Johns Hopkins University, Baltimore, Maryland, 1961–73. Author of Understanding Whitehead; The Life of Alfred North Whitehead.*

WHITEHEAD, ALFRED NORTH (in part) (Micropædia)

V.L.S.P.R. Vaddiparti Lova Surya Prakasa Rao. *Senior Fellow, Centre for Economic and Social Studies, Hyderabad, India.*

DELHI (in part)

V.L.T. Victor-Lucien Tapié (d. 1974). *Member, Academy of Moral and Political Sciences, Institute of France, Paris, 1963–74. Professor of Modern History, University of Paris IV, 1949–70. Author of La France de Louis XIII et de Richelieu and others.*

COLBERT, JEAN-BAPTISTE (Micropædia)

HENRY IV (FRANCE) (in part) (Micropædia)

V.M. Valerio Mariani (deceased). *Professor of the History of Art, University of Naples. Author of Pittori protagonisti della crisi del quattrocento; Giotto.*

LIPPI, FRA FILIPPO (Micropædia)

V.M.S. Vasily Mikhaylovich Sinitsyn (d. 1977). *Professor and Head, Laboratory of Paleogeography, Leningrad A.A. Zhdanov State University, 1961–77; Dean, Department of Geology, 1965–72.*

ASIA (in part)

V.M.W. Vera Muriel White. *Former Extramural Lecturer, University of Cambridge.*

PITT, WILLIAM, THE ELDER (Micropædia)

V.N. Victor Nachtergaele. *Professor of French Literature, Catholic University of Louvain, Belgium.*

WALLOON LITERATURE (Micropædia)

V.N.K. Victor Nikolaevich Kondratiev. *Former Assistant Director, Institute of Chemical Physics, Academy of Sciences of the U.S.S.R., Moscow. Author of Chemical Kinetics of Gas Reactions.*

CHEMICAL REACTIONS (in part)

V.Nu. Vivian Nutton. *Professor of the History of Medicine, University College London, University of London. Author of From Democedes to Harvey.*

GALEN OF PERGAMUM (Micropædia)

V.P.G. Vladimir Petrovich Goncharov. *Former Head, Geology of the Southern Seas Laboratory, Southern Division, Institute of Oceanography, Academy of Sciences of the U.S.S.R., Gelendzhik. Coauthor of Reléf dna i glubinnoe stroenie Chernomoskoï vpadiny.*

ATLANTIC OCEAN, THE (in part)

V.P.P. Victor P. Petrov. *Professor of Geography, California State University, Los Angeles, 1970–74. Author of China: Emerging World Power and others.*

AFGHANISTAN (in part)

V.P.U. Vernon Philip Underwood (d. 1988). *Professor of French, University College, University of London. Author of Verlaine et l'Angleterre; editor of Verlaine's Carnet personnel and others.*

VERLAINE, PAUL (Micropædia)

V.P.Z. Vsevolod Pavlovich Zenkovich. *Former Head of Shore Department, Institute of Oceanography, Academy of Sciences of the U.S.S.R., Moscow. An authority on near-shore oceanography and attendant physical processes.*

OCEANS (in part)

V.R. Vernon Ram. *Copywriter and media consultant. Former Arts Editor, Hong Kong Standard.*

DELHI (in part)

V.R.B. Victor R. Baker. *Regents Professor of Geosciences and of Planetary Sciences, University of Arizona, Tucson. Author of The Channels of Mars.*

CONTINENTAL LANDFORMS (in part)

V.S.C. Vasile S. Cucu. *Professor of Geography, University of Bucharest, Romania. Author of Geografia României.*

BALKAN STATES (in part)

V.Sl. Vladimir Slamecka. *Emeritus Professor of Information and Computer Science, Georgia Institute of Technology, Atlanta. Coauthor of National Information Systems.*

INFORMATION PROCESSING AND INFORMATION SYSTEMS

V.S.M. V. Standish Mallory. *Emeritus Professor of Geological Sciences; Curator of Invertebrate Paleontology, Burke Washington State Museum, University of Washington, Seattle.*

GEOCHRONOLOGY (in part)

V.T.P. Vladimir T. Pashuto (d. 1983). *Professor, Institute of History of the U.S.S.R., Academy of Sciences of the*

U.S.S.R., Moscow. Author of Vneshnyaya politika drevney Rusi and others.

ALGIRDAS (Micropædia)

V.U. Valev Uibopuu. *Novelist. Editor, Estonian Writers' Cooperative, Lund, Sweden. Author of Keegi ei kuule meid.*

ESTONIAN LITERATURE (Micropædia)

V.V.I. Vyacheslav Vsevolodovich Ivanov. *Former Head, Department of Structural Typology, Institute of Slavonic and Balkan Studies, Academy of Sciences of the U.S.S.R., Moscow.*

LANGUAGES OF THE WORLD (in part)

V.V.Z. Vladimir Viktorovich Zhdanov (deceased). *Literary critic. Assistant to the Chief Editor, Kratkaya Literaturnaya Entsiklopediya, Moscow. Author of M. Yu. Lermontov and other works on Russian writers.*

LERMONTOV, MIKHAIL (Micropædia)

V.W.v.H. Victor Wolfgang von Hagen. *Director, Roman Road Expeditions in Europe and North Africa, 1961–70. Director, Inca Highway Expedition to Peru, Bolivia, and Ecuador, 1953–55. Author of Realm of the Incas and others; editor of The Incas.*

PRE-COLUMBIAN CIVILIZATIONS (in part)

W.A. Warren Andrew, M.D. (d. 1982). *Professor of Anatomy, Indiana University, Indianapolis, 1958–82. Author of Textbook of Comparative Histology.*

SUPPORTIVE AND CONNECTIVE TISSUES (in part)

Wa.B. Walter Blair (d. 1992). *Professor of English, University of Chicago, 1944–68. Author of Mark Twain and "Huck Finn"; coauthor of America's Humor: Poor Richard to Doonesbury.*

AMERICAN LITERATURE (in part)

W.A.B. Warren A. Beck. *Professor of History, California State University, Fullerton. Author of New Mexico: A History of Four Centuries; coauthor of An Historical Atlas of New Mexico.*

UNITED STATES OF AMERICA (in part)

W.A.Be. William A. Berggren. *Senior Scientist, Woods Hole (Massachusetts) Oceanographic Institution. Coeditor of Catastrophies and Earth History.*

GEOCHRONOLOGY (in part)

W.A.Bl. Wilford A. Bladen. *Emeritus Professor of Geography, University of Kentucky, Lexington. Author of Geography of Kentucky.*

UNITED STATES OF AMERICA (in part)

W.A.Br. William Arthur Brown. *Montague Burton Professor of Industrial Relations, University of Cambridge. Author of Piecework Bargaining.*

WORK AND EMPLOYMENT (in part)

W.A.C. William A. Chaney. *George McKendree Steele Professor of Western Culture, Lawrence University, Appleton, Wisconsin. Author of The Cult of Kingship in Anglo-Saxon England.*

UNITED KINGDOM (in part)

W.A.Ha. Willard A. Hanna (d. 1993). *Senior Associate, Universities Field Staff International, Hanover, New Hampshire,*

1954–76. *Author of Bung Karno's Indonesia.*

SUKARNO (Micropædia)

W.A.Hu. William Andrew Hustrulid. *Professor of Mining, Colorado School of Mines, Golden. Editor, Underground Mining Methods Handbook.*

INDUSTRIES, EXTRACTION AND PROCESSING (in part)

Wa.J.B. Walter James Boyne. *Director, National Air and Space Museum, Smithsonian Institution, Washington, D.C., 1983–86. Author of The Leading Edge and many others.*

TRANSPORTATION (in part)

W.A.K. Walid Ahmed Khalidi. *Research Fellow, Center for Middle Eastern Studies, Harvard University. Former Professor of Political Studies and Public Administration, American University of Beirut, Lebanon.*

PALESTINE (in part)

W.Am. Winslow Ames (d. 1990). *Associate Professor of Art, University of Rhode Island, Kingston, 1966–75. Curator, Gallery of Modern Art, New York City, 1957–61. Author of Great Drawings of All Time, vol. 1, Italian Drawings and others. CARICATURE, CARTOON, AND COMIC STRIP (in part)*

Wa.M. Wang Mingye. *Professor of Geomorphology, Ch'eng-tu Institute of Geography, Chinese Academy of Sciences. Author of The Mountains in China and others.*

CHUNGKING (in part)

W.A.McD. Walter A. McDougall. *Alloy-Ansin Professor of International Relations, University of Pennsylvania, Philadelphia. Author of The Heavens and the Earth: A Political History of the Space Age and others.*

INTERNATIONAL RELATIONS, 20TH-CENTURY

W.A.N. William Anderson Newman. *Professor of Biological Oceanography, Scripps Institution of Oceanography, University of California, San Diego, at La Jolla. Author of "Evolution of Cirripedes and Their Major Groups" in Barnacle Biology.*

CRUSTACEANS (in part)

W.A.No. William A. Noble. *Professor of South Asian Geography, University of Missouri, Columbia.*

INDIA (in part)

W.A.P. The Rev. William Arthur Purdy (d. 1994). *Secretary for Anglican and Methodist Relations, Secretariat for Promoting Christian Unity, Vatican. Author of The Church on the Move: The Characters and Policies of Pius XII and John XXIII.*

PIUS XII (Micropædia)

W.A.R. William Alexander Robson (d. 1980). *Professor of Public Administration, University of London, 1947–62. Author of Justice and Administrative Law; coauthor of Great Cities of the World.*

CITIES (in part)

PUBLIC ADMINISTRATION (in part)

W.A.Ri. William Andrew Ringler, Jr. (d. 1987). *Professor of English, University of*

Chicago, 1962–80. Editor of The Poems of Sir Philip Sidney.

SIDNEY, SIR PHILIP (Micropædia)

W.A.Ro. W. Andrew Robinson. *Author of Satyajit Ray: The Inner Eye; The Art of Rabindranath Tagore.*

RAY, SATYAJIT (Micropædia)

TAGORE, RABINDRANATH (in part)

(Micropædia)

W.A.W. Warid A. Warid. *Former Professor of Agriculture, University of Al Fateh, Tripoli, Libya. Coauthor of Vegetable Production.*

FARMING AND AGRICULTURAL TECHNOLOGY (in part)

W.B. Wim Blockmans. *Professor of Medieval History, State University of Leiden, The Netherlands. Coauthor of The Burgundian Netherlands.*

NETHERLANDS, THE (in part)

W.Ba. William Barr. *Professor and Head, Department of Geography, University of Saskatchewan, Saskatoon. Author of The Expeditions of the First International Polar Year, 1882–83.*

ARCTIC, THE (in part)

W.B.B. Bill Blakemore. *Correspondent and former Rome Bureau Chief for ABC News.*

JOHN PAUL II (Micropædia)

W.B.Fi. William B. Fisher (d. 1984). *Professor of Geography, University of Durham, England, 1956–81. Author of The Middle East; editor of Cambridge History of Iran (vol. 1).*

AFRICA (in part)

W.B.F.R. William B.F. Ryan. *Senior Research Scientist, Lamont-Doherty Geological Observatory, Columbia University.*

INDIAN OCEAN, THE (in part)

W.B.H. William B. Hubbard. *Professor of Planetary Sciences, University of Arizona, Tucson. Author of Planetary Interiors.*

SOLAR SYSTEM, THE (in part)

W.Bi. Walter Biemel. *Emeritus Professor of Philosophy, State Academy of Art of Düsseldorf, Germany.*

PHILOSOPHICAL SCHOOLS AND DOCTRINES, WESTERN (in part)

W.B.McM. William B. McMahon. *Law enforcement and privacy consultant. Coeditor of Law Enforcement Science and Technology III.*

POLICE (in part)

W.B.N.B. William B.N. Berry. *Professor of Integrative Biology, University of California, Berkeley; Marine Scientist, Lawrence Berkeley Laboratory. Author of Growth of a Prehistoric Time Scale.*

GEOCHRONOLOGY (in part)

W.Br. Wayles Browne. *Associate Professor of Linguistics, Cornell University, Ithaca, New York. Author of Relative Clauses in Serbo-Croatian in Comparison with English.*

LANGUAGES OF THE WORLD (in part)

W.B.S. Wilfred Borden Schofield. *Professor of Botany, University of British*

Columbia, Vancouver. Author of Introduction to Bryology and others.

BRYOPHYTES

W.B.Si. William B. Simmons. *Professor of Mineralogy, University of New Orleans, Louisiana. Coauthor of Rare-Earth Pegmatites of the South Platte District.*

MINERALS AND ROCKS (in part)

W.Bu. William Burrows (d. 1978). *Professor of Microbiology, University of Chicago, 1947–73. Author of Textbook of Microbiology.*

DISEASE (in part)

W.B.W. Wilse B. Webb. *Graduate Research Professor of Psychology, University of Florida, Gainesville. Author of Sleep: An Experimental Analysis.*

SLEEP AND DREAMS (in part)

W.B.Wh. William B. White. *Professor of Geochemistry, Pennsylvania State University, University Park. Author of Hydrology and Geomorphology of Karst Terrains.*

CONTINENTAL LANDFORMS (in part)

W.C. Warren Cowgill (d. 1985). *Professor of Indo-European Linguistics, Yale University, 1972–85. Author of several articles on Indo-European languages.*

LANGUAGES OF THE WORLD (in part)

W.C.A. William C. Atkinson (d. 1992). *Professor of Hispanic Studies, University of Glasgow, 1932–72; Director, Institute of Latin-American Studies, 1966–72. Author of A History of Spain and Portugal; translator of Camões' The Lusiads.*

PORTUGUESE LITERATURE (in part)

SPANISH LITERATURE (in part)

W.C.B. William Charles Brice. *Emeritus Professor of Geography, Victoria University of Manchester, England.*

NORTH AFRICA (in part)

PALESTINE (in part)

TRANSCAUCASIA (in part)

W.C.D. William C. Dickison. *Professor of Biology, University of North Carolina at Chapel Hill. Coauthor of Vascular Plant Systematics.*

PLANTS (in part)

W.C.Di. William C. Dilger. *Associate Professor of Ethology, Cornell University, Ithaca, New York. Author of Psychobiology and others.*

BEHAVIOUR, ANIMAL (in part)

W.C.F. Warren Curtis Freihofer. *Field Associate, Department of Ichthyology, California Academy of Sciences, San Francisco. Author of research papers on the anatomy and systematics of fishes.*

FISHES (in part)

W.C.H. Walther C. Hubatsch (d. 1984). *Professor of Medieval and Modern History, Rhenish Friedrich Wilhelm University of Bonn, West Germany. Author of Die Ära Tirpitz and others.*

TIRPITZ, ALFRED VON (Micropædia)

W.C.Ho. William Coffeen Holton. *Visiting Research Professor of Electrical and Computer Engineering, North Carolina State University, Raleigh. Former Director, Microstructure Sciences, Semiconductor*

Research Corporation, Research Triangle Park, North Carolina.

ELECTRONICS (in part)

W.C.McC. **W. Cheyne McCallum** (d. 1991). *Senior Research Fellow in Psychology, Burden Neurological Institute and University of Bristol, England. Coeditor of The Responsive Brain.*
ATTENTION

W.C.O. **Walter C. Opello, Jr.** *Professor of Political Science, State University of New York at Oswego. Author of Portugal: From Monarchy to Pluralist Democracy.*
PORTUGAL (in part)

W.Cr. **William Cruse.** *Technical Consultant, Uris Theatre Complex, New York City, and New Orleans (Louisiana) Cultural Center. Former Supervisor of Scenic Services, American Broadcasting Company, New York City.*
THEATRICAL PRODUCTION (in part)

W.C.Se. **William C. Seitz** (d. 1974). *George R. Kenan, Jr., Professor of the History of Art, University of Virginia, Charlottesville, 1971–74. Author of Claude Monet.*
MONET, CLAUDE (in part)

W.C.St. **William Campbell Steere** (d. 1989). *Professor of Botany, Columbia University, 1958–75. President, New York Botanical Garden, Bronx, 1970–72. Director, 1958–70. Editor of Fifty Years of Botany.*
BIOLOGICAL SCIENCES, THE (in part)

W.Cu. **William Culican** (d. 1984). *Reader in History, University of Melbourne, 1972–84. Author of The Medes and Persians and others.*

ARCHITECTURE, THE HISTORY OF WESTERN (in part)

HANNIBAL (Micropædia)
KHOSROW II (in part) (Micropædia)
SCULPTURE, THE HISTORY OF WESTERN (in part)

W.D. **Wilma Dykeman.** *Adjunct Professor of English, University of Tennessee, Knoxville. State Historian of Tennessee. Author of The French Broad; coauthor of The Appalachian Mountains and others.*

NORTH AMERICA (in part)

UNITED STATES OF AMERICA (in part)

W.D.B. **Wayne D. Bray.** *Attorney. Author of The Common Law Zone in Panama; compiler of The Controversy Over a New Canal Treaty Between the United States and Panama.*

NORTH AMERICA (in part)

W.De. **Wilfrid Desan.** *Emeritus Professor of Philosophy, Georgetown University, Washington, D.C. Author of The Tragic Finale; The Marxism of Jean-Paul Sartre; and others.*

SARTRE, JEAN-PAUL (Micropædia)

W.D.H. **William Driver Howarth.** *Former Professor of French, University of Bristol, England. Author of Sublime and Grotesque: A Study of French Romantic Drama and others.*
FRENCH LITERATURE (in part)

W.D.J. **William D. Jackson.** *President and Technical Director, HMJ Corporation,*

Chevy Chase, Maryland. Editor in Chief, Magnetohydrodynamics.

ENERGY CONVERSION (in part)

W.D.L.R. **W.D.L. Ride.** *Visiting Fellow, Australian National University, Canberra. Head, School of Applied Science, Canberra College of Advanced Education, 1982–87. Author of A Guide to the Native Mammals of Australia.*

AUSTRALIA (in part)

W.Do. **Wendy Doniger.** *Mircea Eliade Professor of the History of Religions, University of Chicago. Author of Dreams, Illusion, and Other Realities and others.*
HINDUISM (in part)

W.D.P. **W. Douglas Piercey, M.D.** (d. 1972). *Associate Professor of Hospital Administration, University of Toronto, 1954–65. Executive Director, Canadian Hospital Association, Toronto; Editor, The Canadian Hospital Journal, 1954–65.*
MEDICINE (in part)

W.D.R. **Wayne D. Rasmussen.** *Historian, Agricultural History Branch, U.S. Department of Agriculture, Washington, D.C., 1940–86. Editor of Agriculture in the United States: A Documentary History.*
AGRICULTURE, THE HISTORY OF (in part)

W.D.S. **Wilfred D. Stein.** *Professor of Biophysics, Hebrew University of Jerusalem. Author of Transport and Diffusion Across Cell Membranes.*
CELLS (in part)

W.D.Sw. **Will D. Swearingen.** *Research Associate Professor of Geography, Montana State University, Bozeman. Author of Moroccan Mirages: Agrarian Dreams and Deceptions, 1912–1986.*
NORTH AFRICA (in part)

W.D.W. **William David Williams.** *Emeritus Professor of Zoology, University of Adelaide, South Australia. Author of Life in Inland Waters.*
BIOSPHERE AND CONCEPTS OF ECOLOGY, THE (in part)

W.E. **William Epstein.** *Professor of Psychology, University of Wisconsin, Madison. Author of Varieties of Perceptual Learning.*
PERCEPTION, HUMAN (in part)

W.E.A. **Walter E. Allen** (d. 1995). *Professor of English Studies, New University of Ulster, Coleraine, Northern Ireland, 1968–73. Author of The English Novel.*

FIELDING, HENRY (in part) (Micropædia)
SMOLLETT, TOBIAS (Micropædia)

W.E.D. **William E. Duellman.** *Curator, Division of Herpetology, Museum of Natural History; Professor of Systematics and Ecology, University of Kansas, Lawrence. Author of The Hylid Frogs of Middle America.*
AMPHIBIANS (in part)

W.E.K. **Walter Emil Kaegi, Jr.** *Professor of Byzantine and Roman History, University of Chicago. Author of Byzantine Military Unrest and others.*
LEO III (BYZANTINE EMPIRE) (Micropædia)

W.Em. **Walter Emery** (d. 1974). *Director, Novello and Company Ltd., London.*

Specialist on the work of Bach. Author of Bach's Ornaments.

BACH (in part)

W.E.M. **William Edward May** (d. 1989). *Commander, Royal Navy. Deputy Director, National Maritime Museum, Greenwich, England, 1951–68. Naval Assistant to the Director, Compass Department, Admiralty, 1929–51. Author of Compass Adjustment.*
NAVIGATION (in part)

W.E.Mo. **W.E. Mosse.** *Emeritus Professor of European History, University of East Anglia, Norwich, England. Author of Alexander II and the Modernization of Russia and others.*

ALEXANDER II (RUSSIA) (Micropædia)

W.E.M.P.-P. **William E.M. Pryse-Phillips, M.D.** *Professor of Medicine (Neurology), Memorial University of Newfoundland, St. John's. Coauthor of Essential Neurology.*
NERVES AND NERVOUS SYSTEMS (in part)

W.E.P. **Warren E. Preece.** *Member, Board of Editors, Encyclopædia Britannica, Chicago; Vice-Chairman, 1975–79; The Editor, 1964–75. Coauthor of The Technological Order.*

ENCYCLOPAEDIAS AND DICTIONARIES (in part)

PRINTING, TYPOGRAPHY, AND PHOTOENGRAVING (in part)

W.Er. **Walter Erben** (d. 1981). *Professor of Art Education, College of Education of the Ruhr, Dortmund, West Germany. Author of Joan Miró; Chagall.*
MIRÓ, JOAN (in part) (Micropædia)

W.E.S. **William Edward Stubbs** (d. 1973). *Assistant Judge Advocate General, Office of the Judge Advocate General of the British Forces in Germany, London.*

WAR, THE THEORY AND CONDUCT OF (in part)

W.E.St. **Wayne Eric Stark.** *Professor of Electrical Engineering and Computer Science, University of Michigan, Ann Arbor. Coauthor of various articles on telecommunications technology.*

TELECOMMUNICATIONS SYSTEMS (in part)

W.E.T. **William E. Thomson.** *Emeritus Professor of Music Theory and Composition, University of Southern California, Los Angeles. Author of Materials and Structure of Music.*
MUSIC, THE ART OF (in part)

W.E.V. **W. Edgar Vinacke** (d. 1991). *Professor of Psychology, State University of New York at Buffalo, 1963–84. Author of The Psychology of Thinking.*

THOUGHT AND THOUGHT PROCESSES (in part)

W.F. **Wallace Fowlie.** *James B. Duke Professor Emeritus of French Literature, Duke University, Durham, North Carolina. Author of Jean Cocteau; Stendahl; A Guide to Contemporary French Literature; Age of Surrealism.*
COCTEAU, JEAN (Micropædia)

W.F.A. **William Foxwell Albright** (d. 1971). *Professor of Semitic Languages, Johns Hopkins University, Baltimore, Maryland, 1929–58. Author of Archaeology*

of Palestine; From the Stone Age to Christianity.

PALESTINE (*in part*)

PREHISTORIC PEOPLES AND CULTURES (*in part*)

W.F.Kn. Wilfrid F. Knapp. *Fellow and Tutor in Politics, St. Catherine's College, Oxford; Lecturer in Politics, University of Oxford. Author of A History of War and Peace, 1939–65.*

HITLER (*in part*)

W.F.O. Waldir Freitas Oliveira. *Emeritus Professor of History, Federal University of Bahia, Salvador, Brazil.*
SOUTH AMERICA (*in part*)

W.F.W. Warren F. Walker, Jr. *Emeritus Professor of Biology, Oberlin (Ohio) College. Author of Functional Anatomy of Vertebrates and others.*

MUSCLES AND MUSCLE SYSTEMS (*in part*)

W.F.Wh. William Foote Whyte. *Emeritus Professor of Industrial and Labour Relations, Cornell University, Ithaca, New York. Author of Organizational Behavior and others.*

WORK AND EMPLOYMENT (*in part*)

W.Ga. William Gaunt (d. 1980). *Art historian. Special correspondent on art subjects, The Times, London. Author of The Pre-Raphaelite Tragedy; The Aesthetic Adventure.*

ROSSETTI, DANTE GABRIEL (*in part*)
(Micropædia)

ROSSETTI, GABRIELE (*in part*) (Micropædia)

W.G.A. W. Geoffrey Arnott. *Emeritus Professor of Greek Language and Literature, University of Leeds, England.*
TERENCE (Micropædia)

W.G.B. Walter G. Bergmann (d. 1988). *Editor, Schott and Co. Ltd., Music Publishers, London. Author of several articles on Telemann.*

TELEMANN, GEORG PHILIPP (Micropædia)

W.G.Br. Walter G. Bradley, M.D. *Professor and Chairman, Department of Neurology, University of Vermont, Burlington. Author of Disorders of Peripheral Nerves; coeditor of Recent Advances in Myology.*

MUSCLES AND MUSCLE SYSTEMS (*in part*)

W.G.C. William G. Constable (d. 1976). *Curator of Paintings, Boston Museum of Fine Arts, 1938–57. Author of Canaletto.*
CANALETTO (Micropædia)

W.G.C.-S. William Gervase Clarence-Smith. *Reader in the Economic History of Asia and Africa, School of Oriental and African Studies, University of London. Author of The Third Portuguese Empire: A Study in Economic Imperialism, 1826–1975.*

CENTRAL AFRICA (*in part*)

SOUTHERN AFRICA (*in part*)

W.G.D'A. William G. D'Arcy. *Senior Curator, Missouri Botanical Garden, St. Louis. Editor of Solanaceae: Biology and Systematics and others.*

ANGIOSPERMS (*in part*)

W.G.E. W. Gordon East. *Emeritus Professor of Geography, Birkbeck College,*

University of London. Author of An Historical Geography of Europe.

EUROPE (*in part*)

W.G.H. Wayne G. Hammond. *Librarian, Chapin Library, Williams College, Williamstown, Massachusetts. Author of J.R.R. Tolkien: A Descriptive Bibliography; Arthur Ransome: A Bibliography; coauthor of J.R.R. Tolkien, Artist and Illustrator.*

RANSOME, ARTHUR (Micropædia)

TOLKIEN, J.R.R. (Micropædia)

W.G.J. Walton Glyn Jones. *Professor of Scandinavian Studies, University of East Anglia, Norwich, England. Author of Denmark; Tove Jansson; and others.*

SCANDINAVIAN LITERATURE (*in part*)

W.G.M. William George Mokray (d. 1974). *Editor and Publisher, Basketball's Best. Writer for Converse Basketball Yearbook. U.S. correspondent on basketball for European publications. Elected to the Basketball Hall of Fame, 1965.*

SPORTS, MAJOR TEAM AND INDIVIDUAL (*in part*)

W.G.Mo. Will G. Moore (d. 1978). *Reader in French Literature, University of Oxford. Author of La Rochefoucauld: His Mind and Art and others.*

LA ROCHEFOUCAULD, FRANÇOIS VI, DUC DE (Micropædia)

MOLIÈRE (*in part*)

W.Go. Walter Otto Julius Görlitz. *Journalist; Editorial Staff, Die Welt, Hamburg, Germany. Author of History of the German General Staff, 1657–1945.*

LUDENDORFF, ERICH (Micropædia)

ROMMEL, ERWIN (Micropædia)

W.G.Pr. W.G. Prout. *Consultant Surgeon, Portsmouth (England) Group Hospitals.*

CIRCULATION AND CIRCULATORY SYSTEMS (*in part*)

W.G.St. William Glenn Steiner. *Emeritus Professor of Psychology, Bradley University, Peoria, Illinois.*

ALCOHOL AND DRUG CONSUMPTION (*in part*)

W.G.U. William G. Urry (d. 1981). *Reader in Medieval Western Paleography, University of Oxford; Fellow of St. Edmund Hall, Oxford, 1969–81.*

HISTORY, THE STUDY OF (*in part*)

W.H. Wolfgang Helck. *Professor of Egyptology, University of Hamburg, Germany. Author of Manetho und die ägyptischen Königslisten and others.*

HISTORY, THE STUDY OF (*in part*)

W.Ha. Walter Harrelson. *Distinguished Professor Emeritus of Hebrew Bible, Vanderbilt University, Nashville, Tennessee. Author of From Fertility Cult to Worship and others.*

rites and CEREMONIES, SACRED (*in part*)

W.H.B. William H. Baumer (d. 1989). *Major General, U.S. Army Reserve. President, International General Industries, Inc., Washington, D.C., 1963–72. Coauthor of The Little Wars of the United States.*

WAR, THE TECHNOLOGY OF (*in part*)

W.H.Be. William H. Berentsen. *Professor of Geography, University of Connecticut, Storrs. Editor of Contemporary Europe: A Geographical Analysis.*

COLONGE (*in part*)

GERMANY (*in part*)

W.H.Br. Walter Henry Breen. *Former Coeditor, Standard Catalogue of United States Coins. Author of Walter Breen's Complete Encyclopedia of U.S. and Colonial Coins and others.*

COINS AND COINAGE (*in part*)

W.H.C. Walter Houston Clark (d. 1994). *Professor of the Psychology of Religion, Andover Newton Theological School, Newton Centre, Massachusetts, 1962–67. Author of Chemical Ecstasy: Psychedelic Drugs and Religion.*

ALCOHOL AND DRUG CONSUMPTION (*in part*)

W.H.C.F. The Rev. William Hugh Clifford Frend. *Emeritus Professor of Ecclesiastical History, University of Glasgow, Scotland. Author of The Rise of Christianity and others.*

CYPRIAN, SAINT (Micropædia)

W.H.D. William Henry Dawbin. *Honorary Research Associate, Australian Museum, Sydney. Former Reader in Biology, University of Sydney. Author of papers on tuataras.*

REPTILES (*in part*)

W.He. Walter Heinemeyer. *Professor of Medieval History, Philipps University of Marburg, Germany. Coeditor of Politisches Archiv des Landgrafen Philipp.*

PHILIP (HESSE) (Micropædia)

W.H.F. William H. Frederick. *Associate Professor of History, Ohio University, Athens. Author of Visions and Heat: the Making of the Indonesian Revolution and others.*

SOUTHEAST ASIA (*in part*)

W.H.G. W. Horsley Gantt, M.D. (d. 1980). *Associate Professor of Psychiatry, 1932–58; Director, Pavlovian Laboratory, School of Medicine, Johns Hopkins University, Baltimore, Maryland. Senior Scientist, Pavlovian Laboratory, Veterans Administration Hospital, Perry Point, Maryland.*

PAVLOV, IVAN PETROVICH (Micropædia)

W.H.G.A. Walter Harry Green Armytage. *Emeritus Professor of Education, University of Sheffield, England. Author of A Social History of Engineering.*

EADS, JAMES B. (Micropædia)

EVANS, OLIVER (Micropædia)

W.H.I. William Harold Ingrams (d. 1973). *Adviser on Overseas Information to the Secretary of State for the Colonies, United Kingdom, 1950–54. Author of Arabia and the Isles and others.*

ARABIA (*in part*)

W.H.J. W. Hilton Johnson. *Emeritus Professor of Geology, University of Illinois at Urbana-Champaign.*

GEOCHRONOLOGY (*in part*)

W.H.M. William H. Miller, M.D. *Emeritus Professor of Ophthalmology and*

Visual Science, School of Medicine, Yale University.

SENSORY RECEPTION (in part)

W.H.McL. William Hewat McLeod. *Professor of History, University of Otago, Dunedin, New Zealand. Author of Gurū Nānak and the Sikh Religion.*
NĀNAK (Micropædia)

W.H.McN. William H. McNeill. *Robert A. Millikan Distinguished Service Professor Emeritus of History, University of Chicago. Author of The Rise of the West and others.*
STEPPE, THE HISTORY OF THE EURASIAN

W.H.N. William H. Nienhauser, Jr. *Halls-Bascom Professor of East Asian Languages and Literature, University of Wisconsin, Madison. Author of P'i Jih-hsiu; editor of Indiana Companion to Traditional Chinese Literature.*
CHINESE LITERATURE (in part)

W.H.O. William Hosking Oliver. *Former Editor, Dictionary of New Zealand Biography. Author of The Story of New Zealand and others.*
NEW ZEALAND (in part)

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LASSALLE, FERDINAND (Micropædia)

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MIMICRY

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Island, 1977–88. Professor of Mathematics, Claremont Graduate School, California, 1970–77. Author of Topics in Number Theory and others.

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Astronomer, U.S. Naval Observatory, Washington, D.C., 1936–66; Director, Time Service, 1953–66. Coeditor of Continental Drift, Secular Motion of the Pole, and Rotation of the Earth.

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1946–78. Author of The Accessible City and others.

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Author of Ben Donn's Map of Devon, 1765; coauthor of South-West England.

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W.R.P. William Roe Polk. *Historian. Professor of Middle Eastern History, University of Chicago, 1965–75. Author of The United States and the Arab World.*

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W.Ta. Sir William Taylor. *Principal, University of London, 1983–85; Director, Institute of Education, 1973–83. Vice-Chancellor, University of Hull, England, 1985–91; University of Huddersfield, 1994–95. Author of Society and the Education of Teachers and others.*

TEACHING (in part)

W.-t.C. Wing-tsit Chan (d. 1994). *Anna R.D. Gillespie Professor of Philosophy, Chatham College, Pittsburgh, Pennsylvania, 1966–82. Professor of Chinese Philosophy and Culture, Dartmouth College, Hanover, New Hampshire, 1942–66. Author of A Source Book in Chinese Philosophy.*

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EASTERN AFRICA (in part)

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UNITED STATES OF AMERICA (in part)

W.V.E. Wolf Von Eckardt (d. 1995). *Design Critic, Time magazine, 1981–85. Architecture Critic, The Washington Post, 1963–81. Author of A Place to Live: The Crisis of the Cities and others.*

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W.W.W. William Walter Watts (d. 1948). *Keeper, Department of Metal Work, Victoria and Albert Museum, London, 1879–1923. Author of Old English Silver and others.*

DECORATIVE ARTS AND FURNISHINGS
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W.Ze. Wilbur Zelinsky. *Emeritus Professor of Geography, Pennsylvania State University, University Park. Author of The Cultural Geography of the United States and others.*

NORTH AMERICA (in part)

UNITED STATES OF AMERICA (in part)

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University, New Brunswick, New Jersey. Editor of Man in Adaptation.

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Y.T. Yoshinori Takeuchi. *Emeritus Professor of Philosophy of Religion, Kyōto (Japan) University. Author of Philosophy of Shinran; The Heart of Buddhism.*

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Y.V.Y. Yevgeny V. Yastrebov. *Former Professor of Geography, Moscow Oblast Pedagogical Institute. Author of How the Urals Have Been Discovered and others.*

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SOUTHERN AFRICA (in part)

Z.G. Zhong Gong-fu. *Professor, Guangzhou Institute of Geography, China.*

CANTON (in part)

Z.I.A. Zafar Ishaq Ansari. *Former Professor of History, University of Petroleum and Minerals, Dhahran, Saudi Arabia.*

ABŪ ḤANĪFAH (Micropædia)

Z.O. Zoé Oldenbourg-Idalie. *Novelist and freelance writer. Author of Catherine de Russie and others.*

CATHERINE II (Micropædia)

Z.V. Zeno Vendler. *Emeritus Professor of Philosophy, University of California, San Diego, at La Jolla. Author of Linguistics in Philosophy and others.*

LINGUISTICS (in part)

Z.Z. Zeng Zungu. *Professor of Geography, Nanking University, China. Coauthor of World Geography.*

NANKING (in part)

Names of Contributors

Listed below, with initials that identify them, are the names of persons who have written articles or sections of articles. For brief summaries of their positions and the titles of all articles contributed, see under authors' initials in the list on pages 531-654.

- Aaron, Richard I. R.Aa.
 Abbagnano, Nicola. N.Ab.
 Abdo, Ass'ad Sulaiman. A.S.A.
 Abel-Smith, Brian. B.A.-S.
 Aberdare, Morys George Lyndhurst Bruce, 4th Baron. A.
 Abondolo, Daniel M. D.M.Ab.
 Abraham, Gerald E.H. G.E.H.A.
 Abrahams, Harold Maurice. H.M.A.
 Abrahart, Edward Noah. E.N.A.
 Abramson, Glenda M. G.M.A.
 Abt, Samuel. S.Ab.
 Abu Jaber, Kamel S. K.S.A.J.
 Abu-Lughod, Janet L. J.L.A.-L.
 Abun-Nasr, Jamil M. J.M.A.-N.
 Accordi, Bruno. B.A.
 Ackerman, James S. J.S.Ac.
 Ackoff, Russell L. R.L.A.
 Acton, Harry Burrows. H.B.A.
 Adamovich, Anthony. A.Ad.
 Adams, Charles Joseph. C.J.A.
 Adams, Douglas Q. D.Q.A.
 Adams, Robert M. R.M.A.
 Adams, Robert McCormick. R.M.As.
 Adams, Ron. R.Ad.
 Adejuwon, James Oladipo. J.O.A.
 Adhémar, Jean. J.Ad.
 Adkins, A.W.H. A.W.H.A.
 Adkins, Dorothy C. D.C.A.
 Adler, Jeremy D. J.D.Ad.
 Ado, Yuri M. Y.M.A.
 Adotevi, Stanislas Spero. S.S.A.
 Agenbroad, Larry D. L.D.A.
 Aherne, Sister Consuelo Maria. C.M.A.
 Ahlström, Gösta W. G.W.A.
 Ahmad, Nafis. N.A.
 Ahmadjian, Vernon. V.A.
 Ahrweiler, Hélène. H.Ah.
 Aiyappan, Ayinipalli. A.Ai.
 Ajayi, J.F. Ade. J.F.A.A.
 Akhtar, Rais. R.Ak.
 Akita, George. G.Ak.
 Alam, Muzaffar. Muz.A.
 Alavi, Hamza A. H.A.A.
 Alba, Victor. V.Al.
 Alberts, Bruce M. B.M.A.
 Albright, William Foxwell. W.F.A.
 Albritton, Claude C. C.C.A.
 Albury, E. Paul. E.P.A.
 Aleem, Anwar Abdel. An.A.A.
 Alegi, Peter Christopher. P.C.A.
 Alekseev, Arkody Vladimirovich. A.V.A.
 Alexander, Lewis M. L.M.A.
 Alexander, Robert J. R.J.Al.
 Alexander, Robert McNeill. R.McN.A.
 Alexeeva, Nina Nikolaevna. N.N.A.
 Alexopoulos, Constantine John. C.J.Al.
 Alford, Alfred E. A.E.A.
 Alford, R.F.G. R.F.G.A.
 Ali, Mohammad. M.Al.
 Alip, Eufonio M. Eu.M.A.
 Alisky, Marvin H. M.H.A.
 Alitto, Guy S. G.S.A.
 Allais, Maurice. Ma.A.
 Allan, John. J.Al.
 Allan, Nigel John Roger. N.J.R.A.
 Allard, The Rev. Michel Adrien. M.A.Al.
 Allard, R.W. R.W.A.
 Allchin, Frank Raymond. F.R.Al.
 Allcock, John B. J.B.A.
 Allen, Francis A. F.A.A.
 Allen, Garland Edward. G.E.Al.
 Allen, Gay Wilson. G.W.Al.
 Allen, Geoffrey Freeman. G.F.A.
 Allen, Walter E. W.E.A.
 Aller, Lawrence Hugh. L.H.A.
 Allibone, Thomas Edward. T.E.A.
 Allott, Antony Nicolas. A.N.A.
 Allworth, Edward. E.Al.
 Almagià, Roberto. Ro.A.
 Alpert, Norman R. N.R.A.
 Al-Shahi, Ahmed S. A.Al-Sh.
 Alston, Rex. R.Al.
 Amadio, The Rev. Anselm H. A.H.Ao.
 Amaral, Ilídio Melo Peres do. I.M.P. do A.
 Amengual, Barthélemy. B.Am.
 Amerine, Maynard A. M.A.A.
 Ames, Winslow. W.Am.
 Amir, Amir R. A.R.A.
 Amundson, Clyde H. C.H.A.
 Anastaplo, George. G.An.
 Andersen, Robert A. R.A.An.
 Anderson, David R. D.R.A.
 Anderson, Donald M. D.An.
 Anderson, Edward W. E.W.A.
 Anderson, Franklin K. F.K.A.
 Anderson, Kym. K.An.
 Anderson, Matthew Smith. M.S.An.
 Anderson, Robert T. R.T.A.
 Anderson, Stanley Victor. S.V.A.
 Anderson, Thomas P. T.P.A.
 Andrade U., Victor. V.A.U.
 Andreopoulos, George J. G.J.An.
 Andrew, Dudley. D.A.
 Andrew, Richard J. R.J.A.
 Andrew, Warren. W.A.
 Andrews, Linda B. L.B.An.
 Andrews, William L. W.L.A.
 Andreyev, Nikolay. N.An.
 Andrups, J.A. J.A.A.
 Angel, Pierre Robert. P.R.A.
 Anguizola, Gustavo. Gu.A.
 Annas, George J. G.J.A.
 Ansari, Zafar Ishaq. Z.I.A.
 Anschutz, Richard Paul. R.P.An.
 Anthony, Jean Daniel. J.D.A.
 Anthony, John Duke. J.D.An.
 Anweiler, Oskar. O.A.
 Apostol, Tom M. T.M.A.
 Aquilecchia, Giovanni. G.A.
 Arasaratnam, Sinnappah. S.Ara.
 Ardagh, John Anthony Charles. J.A.C.A.
 Aretin, Karl Otmar, Baron von. K.O.v.A.
 Arey, Leslie B. L.B.A.
 Arfa, Maj. Gen. Hassan. H.Ar.
 Argov, Daniel. D.Ar.
 Arguello, Rosendo. R.A.
 Argyle, Michael. M.Ar.
 Arlazorov, Mikhail S. M.S.A.
 Armstrong, A. Hilary. A.H.A.
 Armstrong, Annette Elizabeth. A.E.Ar.
 Armstrong, David M. D.M.A.
 Armstrong, Lloyd Van Horn. L.V.A.
 Armstrong, Terence Edward. T.E.Ar.
 Armytage, Walter Harry Green. W.H.G.A.
 Arnade, Charles W. C.W.A.
 Arnason, H. Harvard. H.H.A.
 Arnfield, A. John. A.J.A.
 Arnold, Denis Midgley. D.M.Ar.
 Arnold, Godfrey Edward. G.E.A.
 Arnott, W. Geoffrey. W.G.A.
 Arrington, Leonard James. L.J.A.
 Arthur, Paul. Pa.A.
 Artmann, Benno. B.Ar.
 Aruja, Endel. E.Ar.
 Arvon, Henri. H.A.
 Asanachinta, Col. Phoon Phon. P.P.A.
 Ashbaugh, James G. J.G.A.
 Ashford, Norman J. N.J.A.
 Ashley, Maurice. M.As.
 Ashmole, Bernard. B.As.
 Ashmole, N. Philip. N.P.As.
 Ashton, George D. G.D.A.
 Asimov, Isaac. I.A.
 Asinov, Eliot. E.As.
 Aspinall, Arthur C.V.D. A.As.
 Asprey, Larned B. L.B.As.
 Asprey, Robert Brown. R.B.A.
 Atherden, Lewis Malcolm. L.M.At.
 Atherton, James Stephen. J.S.A.
 Atiyah, Sir Michael Francis. M.F.A.
 Atkins, Ralph Charles. R.C.At.
 Atkins, P.W. P.W.At.
 Atkinson, William C. W.C.A.
 Attwater, Donald. D.At.
 Atwater, Gordon I. G.I.A.
 Aubert, Roger-François-Marie. R.-F.-M.A.
 Aubin, Hermann. H.Au.
 Auboyer, Jeannine. J.Au.
 Auclair, Marcelle. M.A.
 Aulie, Richard Paul. R.P.A.
 Aumann, Francis R. F.R.A.
 Aung-Thwin, Michael Arthur. M.A.A.-T.
 Aurenhammer, Hans. Ha.A.
 Austerlitz, Robert. R.Au.
 Austin, Oliver L., Jr. O.L.A.
 Auty, Robert. Ro.Au.
 Avery, Peter William. P.W.A.
 Avila, Héctor Fernando. H.F.A.
 Avila-Martel, Alamiro de. A.de A.-M.
 Avrich, Paul. P.A.
 Axelson, Eric. E.A.
 Ayala, Francisco Jose. F.J.A.
 Ayyar, Nagarajan Panchapagesan. N.P.A.
 Azcona, The Rev. Tarsicio de. T.d.A.
 Baaren, Theodorus P. van. T.P.v.B.
 Babaev, Agadjan G. A.G.B.
 Bablet, Denis. De.B.
 Bachrach, Bernard S. B.S.Ba.
 Back, George I. G.I.Bk.

- Bacon, Frederick E. F.E.B.
 Badash, Lawrence. L.Ba.
 Badian, E. E.Ba.
 Bahry, Louay Y. L.Y.B.
 Baigent, Margaret J. M.J.B.
 Bailey, Robert C. R.C.B.
 Bain, Joe S. J.S.B.
 Baines, John R. J.R.Ba.
 Bainton, Roland H. R.H.B.
 Baird, A. Craig. A.C.B.
 Baker, D. James. D.J.Ba.
 Baker, John Fleetwood Baker,
 Baron. J.F.Br.
 Baker, Kathleen M. K.M.B.
 Baker, Peter S. P.S.Ba.
 Baker, Raymond William. R.W.Ba.
 Baker, Samuel John Kenneth. S.J.K.B.
 Baker, Victor R. V.R.B.
 Balakrishna, Suri. S.B.
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 Baldwin, A. Richard. A.R.B.
 Baldwin, Marshall W. M.W.B.
 Balfet, Hélène J. He.Ba.
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 Balinsky, Boris Ivan. B.I.B.
 Ballendorf, Dirk Anthony. D.A.B.
 Ballesteros Gaibrois, Manuel. M.B.G.
 Ballhatchet, Kenneth A. K.A.B.
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 Balsdon, John P.V. Dacre. J.P.V.D.B.
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 Bandler, David K. D.K.B.
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 Bannerman, W. Mary. W.M.B.
 Banton, Michael Parker. M.P.B.
 Banzragch, D. D.Ba.
 Barany, George. G.Ba.
 Barbour, Nevill. N.B.
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 Barkin, Kenneth. Ke.B.
 Barlow, Frank. F.Ba.
 Barlow, Jon Charles. J.C.B.
 Barna, Victor. V.B.
 Barnard, Alan John. A.J.B.
 Barnard, Raymond Walter. R.W.Bd.
 Barnes, Clifford A. C.A.B.
 Barnes, Harry Elmer. H.E.B.
 Barnes, Jonathan. J.B.
 Barnes, Robert D. R.D.Ba.
 Barnett, Henry Lewis. H.L.B.
 Barnett, Richard David. R.D.B.
 Baron, Salo Wittmayer. S.W.B.
 Baron, Samuel H. S.H.B.
 Barr, Nicholas A. N.A.Ba.
 Barr, William. W.Ba.
 Barraclough, Geoffrey. G.Bh.
 Barrère, Jean-Bertrand. J.-B.Ba.
 Barrington, Ernest J.W. E.J.W.B.
 Barrow, Geoffrey Wallis Steuart. G.W.S.B.
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 Bar-Zohar, Michael. M.Ba.
 Barzun, Jacques. J.Ba.
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 Bassham, James Alan. J.A.B.
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 Bates, David V. D.V.B.
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 Baumer, Maj. Gen. William H. W.H.B.
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 Bawden, Charles R. C.R.B.
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 Baxter, Douglas C. D.C.B.
 Baxter, Glen W. G.W.Ba.
 Baxter, Ian F.G. I.F.G.B.
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 Bayley, Charles Calvert. C.C.B.
 Bazin, Germain René Michel. G.R.M.B.
 Beadle, Richard. Ri.B.
 Beale, Geoffrey H. G.H.B.
 Bealer, Lewis W. L.W.B.
 Bean, Lowell John. Lo.J.B.
 Beaufort, Lieven Ferdinand de. L.F. de B.
 Beck, Alfred C. A.C.Bk.
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 Beck, Kevin Charles. K.C.B.
 Beck, Warren A. W.A.B.
 Becker, Alfons. Al.Be.
 Becker, Jillian. Ji.B.
 Beckerman, Bernard. B.Be.
 Beckingsale, Bernard Winslow. B.W.B.
 Beckson, Karl. K.Be.
 Beegle, Dewey M. D.M.Be.
 Beeman, Richard R. R.R.B.
 Beer, John Bernard. J.B.B.
 Beeston, Alfred Felix L. A.F.L.B.
 Beeton, Alfred M. A.M.B.
 Behnke, Robert John. R.J.B.
 Beier, Ulli. U.Be.
 Belaval, Yvon. Y.B.
 Belford, Geneva G. G.G.B.
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 Bell, Ronald Percy. R.P.B.
 Belton, Michael J.S. M.J.S.B.
 Bemis, Samuel Flagg. S.F.Be.
 Benedek, Thomas G. T.G.B.
 Benedict, Roger William. R.W.B.
 Benedikz, Benedikt Sigurdur. B.S.B.
 Benenson, Susan Elizabeth. S.E.B.
 Ben-Gurion, David. D.B.-G.
 Benítez, Fernando. F.Be.
 Bennahum, Ninotchka Devorah. N.D.B.
 Benneh, George. G.Be.
 Bennett, The Rev. John C. J.C.Be.
 Bensing, Manfred. M.Be.
 Benson, D. Mary. D.M.B.
 Benson, Fred J. F.J.B.
 Benson, Lyman. L.Be.
 Bent, Ian D. I.Be.
 Bentley, John Beresford. Jo.Be.
 Bentley, T. Keilor. T.K.B.
 Benz, Ernst Wilhelm. E.W.B.
 Bercuson, David J. D.J.Be.
 Berenbaum, Michael. Mi.Be.
 Berend, Ivan T. I.T.B.
 Berengo, Marino. Ma.B.
 Berenson, Louis Stanley. L.S.B.
 Berentsen, William H. W.H.Be.
 Berg, Richard E. R.E.B.
 Berg, William J. Wi.J.B.
 Berggren, John L. J.L.B.
 Berggren, William A. W.A.Be.
 Bergmann, Peter G. P.G.Be.
 Bergmann, Walter G. W.G.B.
 Bergsland, Knut. K.B.
 Bergsten, Staffan. S.Be.
 Berkman, Eugene M. E.M.B.
 Berlyn, Graeme Pierce. G.P.B.
 Berlyne, D.E. D.E.B.
 Bernard, François. F.B.
 Bernard, Thomas J. Th.B.
 Berndt, Ronald M. R.M.B.
 Bernfield, Merton R. M.R.B.
 Bernstein, Jeremy. J.Be.
 Bernstein, Marvin David. M.D.B.
 Berrall, Julia S. Ju.S.B.
 Berrill, N.J. N.J.B.
 Berry, André. A.By.
 Berry, R. Stephen. R.S.Be.
 Berry, William B.N. W.B.N.B.
 Bertram, C.K. C.K.B.
 Bertram, G.C.L. G.C.L.B.
 Bertrand, Trent J. T.J.B.
 Bertsch, George F. G.F.B.
 Bessac, Frank Bagnall. F.B.B.
 Bessarabov, Georgy Dmitriyevich. G.D.B.
 Beuve-Méry, Hubert. H.B.-M.
 Beven, Keith J. K.J.B.
 Bevington, David. D.Bev.
 Beynon, John Herbert. J.H.Be.
 Bharati, Agehananda. A.Bh.
 Bhardwaj, Surinder M. S.M.B.
 Bianchi, Ugo. U.B.
 Bibby, Cyril. C.Bi.
 Biberaj, Elez. E.Bi.
 Bickerman, E.J. E.J.Bi.
 Bickerton, Ian J. I.J.B.
 Biel, Victor J.P. V.Bi.
 Bielenstein, Hans H.A. H.H.A.B.
 Bieler, Ludwig G.J. L.G.J.B.
 Biemel, Walter. W.Bi.
 Bierwagen, Gordon P. G.P.Bi.
 Bietenholz, Peter G. P.G.B.
 Biezais, Haralds. H.Bi.
 Bigalke, R.C. R.C.Bi.
 Bigler, B. Philip. B.P.B.
 Billington, David P. D.P.B.
 Billington, Philip N. P.N.B.
 Binder, Alan K. A.K.Bi.
 Bing, R.H. R.H.Bi.
 Bira, Sh. Sh.Bi.
 Bird, J. Brian. J.B.Bd.
 Bird, Otto Allen. O.A.B.
 Bireley, The Rev. Robert L. R.L.B.
 Birkett, Jennifer. J.Bir.
 Birkhoff, Garrett. G.Bi.
 Birmingham, David. D.Bi.
 Birnholz, Alan Curtis. A.C.Bi.
 Bishop, Barry C. B.C.Bi.
 Bissell, Harold J. H.J.Bi.
 Bisson, T.N. T.N.B.
 Bivar, Adrian David Hugh. A.D.H.B.
 Bix, Robert A. R.A.Bx.
 Black, Clinton V. C.V.B.
 Black, Sir Douglas A.K. D.A.K.B.
 Black, Michael H. M.H.Bi.
 Bladen, Wilford A. W.A.Bi.
 Blagoy, Dimitry Dimitriyevich. D.D.B.
 Blair, Claude. C.Bi.
 Blair, Steven N. S.N.B.
 Blair, Walter. Wa.B.
 Blake, Gerald Henry. G.H.Bi.
 Blake, Robert Norman William Blake,
 Baron. B.
 Blakemore, Bill. W.B.B.
 Blank, Sheldon H. S.H.Bi.
 Blanksten, George I. G.I.B.
 Blanshard, Brand. B.Bi.
 Blaug, Mark. M.Bg.
 Blažek, Miroslav. M.Bi.
 Bleaney, Brebis. B.Ble.
 Blendinger, Friedrich. F.Br.
 Bliss, Milton E. M.E.Bi.
 Bloch, Raymond. R.Bi.
 Block, Eric. E.Bi.
 Blockmans, Wim. W.B.
 Blond, Georges. G.Bi.
 Blondel, Jean F.P. J.F.P.B.
 Bloom, Floyd E. F.E.Bi.

- Blumenthal, Henry J. H.J.Bl.
 Blumenthal, Uta-Renate. U.-R.B.
 Blust, Robert Andrew. R.A.Bl.
 Blyth, Conrad Alexander. C.A.Bl.
 Boardman, Sir John. Jo.Bo.
 Boateng, Ernest Amano. E.A.B.
 Bobek, Hans. H.B.
 Bockris, John O'M. J.O'M.B.
 Bode, Hendrik W. H.W.B.
 Bogdanov, Konstantin
 Trifonovich. K.T.B.
 Bognetti, Giovanni. G.B.
 Bokser, Rabbi Ben Zion. B.Z.B.
 Boland, Frederick Henry. F.H.B.
 Bold, Harold C. H.C.B.
 Bolland, O. Nigel. O.N.B.
 Bolle, Kees W. K.W.Bo.
 Bollnow, Otto Friedrich. O.F.B.
 Bolt, Bruce A. B.A.B.
 Bolton, Geoffrey C. G.C.Bo.
 Bonavia, David Michael. D.M.Bo.
 Bond, Donald F. D.F.B.
 Bonilla, José. Jo.B.
 Bonner, John Tyler. J.T.Bo.
 Bonnerot, Jean. J.Bt.
 Boom, Brian M. B.M.Bo.
 Booth, Doug. D.Bo.
 Borders, James M. J.M.Bo.
 Borgstrom, Georg A. G.A.B.
 Borlaza, Gregorio C. G.C.B.
 Bornecque, Jacques-Henry. J.-H.B.
 Bornstein, Ira. I.Bo.
 Bornstein, Marc H. M.H.Bo.
 Borth, David E. Da.E.B.
 Borth, Paul F. P.F.B.
 Bosco, Umberto. U.Bo.
 Bose, Raj C. R.C.Bo.
 Bosisio, Alfredo. Al.B.
 Bottigheimer, Karl S. K.S.B.
 Boufford, David E. D.E.Bo.
 Boulding, Kenneth E. K.E.Bo.
 Bouloiseau, Marc. M.Bo.
 Bounds, John H. J.H.Bo.
 Bousfield, Edward L. E.L.B.
 Bouvier, Jean. Je.B.
 Bouwsma, William J. W.J.Bo.
 Bowen, James. J.Bo.
 Bowersock, G.W. G.W.Bo.
 Bowle, John Edward. J.E.B.
 Bowles, Edmund Addison. E.A.Bo.
 Bowman, Alan K. A.K.B.
 Bowman, John S. J.S.Bo.
 Bowness, Sir Alan. Al.Bo.
 Boxer, Baruch. B.Bo.
 Boyer, Carl B. C.B.B.
 Boyle, John Andrew. J.A.Bo.
 Boyne, Walter James. Wa.J.B.
 Bracewell, C.W. C.W.Br.
 Bradbury, Savile. S.Br.
 Bradford, Ernle. E.Br.
 Bradley, Harold Whitman. H.W.Br.
 Bradley, John F.N. J.F.N.B.
 Bradley, Sir Kenneth. K.Br.
 Bradley, Rupert Stevenson. R.S.B.
 Bradley, Walter G. W.G.Br.
 Brady, The Rev. Ignatius Charles. I.C.B.
 Braidwood, Robert J. R.J.Br.
 Brand, Donald Dilworth. D.D.Br.
 Brander, Laurence. La.B.
 Brandon, James R. J.R.B.
 Brandon, The Rev. Samuel G.F. S.G.F.B.
 Brandt, Andres R.F.T. von. A.v.B.
 Brant, Irving. I.Bt.
 Brasted, Robert C. R.C.Br.
 Brathwaite, Edward Kamau. E.Be.
 Bräuer, Günter. G.Br.
 Braun, Armin C. A.C.Br.
 Braun, Robert Denton. R.D.Br.
 Bray, Wayne D. W.D.B.
 Bready, James H. Ja.H.B.
 Breed, C.S. C.S.Br.
 Breed, William J. W.J.Br.
 Breen, Walter Henry. W.H.Br.
 Breeze, David J. D.J.Br.
 Brereton, Bridget M. B.M.B.
 Brett, Martin. Ma.Br.
 Brett, Michael. M.Br.
 Brice, William Charles. W.C.B.
 Brick, Cindy. C.B.
 Bridenbaugh, Peter R. P.R.B.
 Bridges, Edward Bridges, 1st Baron. E.B.
 Briggs, Asa Briggs, Baron. As.B.
 Bright, John. Jo.Br.
 Bright, William O. W.O.B.
 Brill, Reginald. R.Br.
 Brisby, Liliana. L.B.
 Britt, Kenneth W. K.W.Br.
 Britter, Eric V.B. E.V.B.B.
 Brix, Andrew C. An.C.B.
 Broadus, James M. J.M.B.
 Brock, John Fleming. J.F.B.
 Brodie, Fawn McKay. F.M.B.
 Brody, David. Da.B.
 Brogan, Hugh. H.Br.
 Brombert, Victor. V.Br.
 Bromiley, Geoffrey W. G.W.B.
 Bromke, Adam. A.Br.
 Brommelle, Norman Spencer. N.S.B.
 Broughton, David. Da.Bo.
 Brown, Alice. A.Brn.
 Brown, David. Da.Br.
 Brown, Elizabeth A.R. E.A.R.B.
 Brown, Frank A., Jr. F.A.B.
 Brown, Gregory K. G.K.B.
 Brown, J.A.C. J.A.C.B.
 Brown, J. Guthrie. J.G.B.
 Brown, John Russell. J.R.Br.
 Brown, L. Carl. L.C.Br.
 Brown, Laurie M. L.M.B.
 Brown, Leslie Hilton. L.H.B.
 Brown, Louis. L.Br.
 Brown, Maurice J.E. M.J.E.B.
 Brown, Peter R.L. P.R.L.B.
 Brown, Ray E. R.E.Bn.
 Brown, T. Julian. T.J.Br.
 Brown, William Arthur. W.A.Br.
 Browne, Wayles. W.Br.
 Browning, David G. D.G.B.
 Browning, Robert. R.B.
 Bruce, Frederick Fyvie. F.F.B.
 Bruhat, Jean. J.Bru.
 Bruk, Solomon Ilich. S.I.B.
 Bruman, Henry J. H.J.Bn.
 Brunner, Hellmut. He.B.
 Brunnschweiler, Dieter. Di.B.
 Bruschi, Arnaldo. Ar.B.
 Brush, Stephen G. S.G.B.
 Brusher, The Rev. Joseph
 Stanislaus. J.S.Br.
 Bry, Doris. D.Br.
 Bryant, Sir Arthur. Ar.Br.
 Bryant, John H. J.H.Br.
 Bryceson, Deborah Fahy. D.F.Br.
 Bryson, John. J.Bn.
 Buccini, Anthony F. A.F.Bu.
 Buchan, The Hon. Alastair Francis. A.F.B.
 Buchanan, Robert Angus. R.A.Bu.
 Buckmaster, Barbara. B.Br.
 Budden, Julian Medforth. J.M.Bu.
 Budenholzer, Roland A. R.A.B.
 Budinger, Thomas F. T.F.B.
 Buechner, Thomas S. T.S.Bu.
 Buettner-Janusch, John. J.B.-J.
 Bugh, Glenn Richard. G.R.B.
 Buisseret, David J. D.J.Bu.
 Buitenen, J.A.B. van. J.A.B.v.B.
 Bullock, Alan Bullock, Baron. A.B.
 Bullough, The Rev. Sebastian. S.Bh.
 Bundy, Colin J. C.J.B.
 Burgess, Anthony. An.B.
 Burggren, Warren W. W.W.Bu.
 Burghardt, The Rev. Walter John. W.J.Bu.
 Burke, James D. J.D.Bu.
 Burke, Ulick Peter. U.P.B.
 Burkett, Elinor C. E.C.B.
 Burki, Shahid Javed. S.J.B.
 Burn, Andrew Robert. A.R.Bu.
 Burnaby, The Rev. John. Jo.Bu.
 Burns, E. Bradford. E.B.B.
 Burns, Thomas W. T.W.B.
 Burr, Robert N. R.N.Bu.
 Burri, Peter H. P.H.B.
 Burrows, William. W.Bu.
 Burrus, John N. J.N.B.
 Burton, Ivor F. I.F.B.
 Burton, Milton. M.Bu.
 Burton, Richard D.E. R.D.E.B.
 Burt, Edward Howland, Jr. E.H.B.
 Buru, Mukhtar Mustafa. Mu.B.
 Bush, Douglas. D.B.
 Bush-Brown, Albert. A.B.-B.
 Bushman, Donald O. D.O.B.
 Bushnell, David. D.Bu.
 Bushnell, Geoffrey H.S. G.H.S.B.
 Buss, Robin Caron. R.C.Bu.
 Busuttil, Salvino. S.Bu.
 Butland, Gilbert James. G.J.B.
 Butler, Joseph T. J.T.B.
 Butler, M.H. M.H.B.
 Butlin, Martin. Ma.Bu.
 Butt, John Everett. J.E.Bu.
 Butterfield, Lyman H. L.H.Bu.
 Buttinger, Joseph. J.Bu.
 Butts, Allison. A.Bu.
 Butzer, Karl W. K.W.B.
 Buxton, Richard G.A. R.G.A.B.
 Byrkit, James W. J.W.B.
 Byrne, Robert Howard. R.H.By.
 Byrnes, Robert F. R.F.B.
 Cadbury, Henry J. H.J.C.
 Cadoux, Theodore John. T.J.C.
 Cahen, Claude. C.C.
 Cahill, James F. J.F.C.
 Cahir, John J. J.J.Ca.
 Cahn, Robert W. R.W.C.
 Cain, A.J. A.J.Ca.
 Cain, Seymour. S.C.
 Calkin, Carleton Ivers. C.I.C.
 Calkins, Philip B. P.B.Ca.
 Callaghan, Peter John. P.J.C.
 Calmon, Pedro. P.Ca.
 Calne, Sir Roy Yorke. R.Y.C.
 Calogero, Guido. G.C.
 Camacho, Jorge A. J.A.Ca.
 Camara, Camille. Ca.C.
 Cameron, Roy Eugene. R.E.C.
 Campana, The Rev. Pier
 Paolo del. P.P. del C.
 Campbell, Alan K. A.K.Ca.
 Campbell, Christopher S. C.S.C.
 Campbell, Eila M.J. E.M.J.C.
 Campbell, James T. J.T.Ca.
 Campbell, John R. J.R.C.
 Campbell-Mohn, Celia I. C.I.C.-M.
 Camu, Pierre. P.C.
 Cannon-Brookes, Peter. P.C.-B.

- Canright, James Edward. J.E.Ca.
 Capers, Gerald M. G.M.C.
 Caponigri, A. Robert. A.R.C.
 Cardona, George. Ge.Ca.
 Cardoze, Nydia María. N.M.C.
 Carey, Francis A. F.A.Ca.
 Carey, Margret A. Ma.A.C.
 Carli, Enzo. E.Ca.
 Carlsson, Sten C.O. S.C.O.C.
 Carmagnani, Marcello A. M.A.Ca.
 Carmichael, Robert S. R.S.Ca.
 Caroli, Betty Boyd. B.B.C.
 Carpenter, Kenneth J. K.J.C.
 Carr, Bruce Alan. B.A.C.
 Carr, Edward H. E.H.C.
 Carr, Michael H. M.H.Ca.
 Carr, Sir Raymond. R.Ca.
 Carruthers, John E. J.E.C.
 Carsaniga, Giovanni. G.Car.
 Carson, Annette. A.C.
 Carson, Hampton L. H.L.C.
 Carter, Francis William. F.W.C.
 Carter, Harold. H.Ca.
 Cartwright, Frederick F. F.F.C.
 Cartwright, Janet M. J.M.Ca.
 Cartwright, Rosalind D. R.D.C.
 Cary, Max. M.Car.
 Cary, Otis. O.C.
 Casey, H.C., Jr. H.C.C.
 Cash, Arthur H. A.H.Ca.
 Casolani, Lieut. Col. Charles Edward. C.E.C.
 Castañeda, Concepción E. C.E.Ca.
 Castex, Pierre-Georges. P.-G.Ca.
 Castle, Peter Henry John. P.H.J.C.
 Caswell, John Edwards. Jo.E.C.
 Catalano, Eduardo F. E.F.C.
 Caudle, Ben H. B.H.C.
 Caughey, John W. J.W.C.
 Causou, Jean-Louis. J.-L.Ca.
 Caviedes, Cesar N. C.N.Ca.
 Cawkwell, George Law. G.L.Ca.
 Cessi, Roberto. R.Ce.
 Cestre, Charles. C.Ce.
 Chadwick, Charles. C.Ch.
 Chadwick, The Very Rev. Henry. H.Cha.
 Chadwick, W. Owen. W.O.C.
 Chaillet, Ned. N.Ch.
 Chaisson, Eric J. E.J.C.
 Chaix-Ruy, Jules-Marie. J.C.-R.
 Chambers, Richard L. Ri.L.C.
 Chambers, W. Walker. W.W.C.
 Chambliss, J.J. J.J.Ch.
 Chambre, The Rev. Henri. H.C.
 Chamot, Mary. M.Ch.
 Champakalakshmi, R. R.Ch.
 Champion, Timothy C. T.C.C.
 Chan, David B. D.B.C.
 Chan, Hoklam. H.Ch.
 Chan, Wing-tsit. W.-t.C.
 Chandlerli, Abdel Kader. A.K.Ch.
 Chandler, David P. D.P.Ch.
 Chandra, Pramod. P.Ch.
 Chandrasekhar, Sripati. S.Ch.
 Chaney, William A. W.A.C.
 Chaney, William R. W.R.C.
 Chang, Chen-tung. C.-t.C.
 Chang, Pao-Chi. P.-C.C.
 Chang, Sen-dou. S.-d.C.
 Chao Lin. Ch.L.
 Chapanis, Alphonse. A.L.C.
 Chapman, Brian. B.Ch.
 Chapman, Clark R. C.R.C.
 Chapman, Floyd Barton. F.B.C.
 Charles, James A. J.A.C.
 Charles, Jean-Léon. J.-L.Ch.
 Charleston, Robert Jesse. R.J.Ch.
 Charlton, Donald Geoffrey. D.G.Ch.
 Chastenet de Castaing, Jacques. J.C. de C.
 Chatterjee, Shiba P. S.P.C.
 Cheever, Federico. F.C.
 Chemla, Karine Carole. K.C.C.
 Chen, Cheng-Siang. C.-S.Ch.
 Ch'en, Jerome. Je.Ch.
 Chen, Theodore Hsi-en. T.H.C.
 Cheng, Bin. Bi.C.
 Cheng, Chu-yuan. C.-y.C.
 Chenu, The Rev.
 Marie-Dominique. M.-D.Ch.
 Cherniack, Neil S. N.S.C.
 Cherry, John. J.Ch.
 Chevalier, Willie J. W.J.C.
 Chevallier, Jean-Jacques. J.-J.C.
 Chiang Yee. C.Y.
 Chiappini, Luciano. L.Ch.
 Chib, Sukhdev Singh. S.S.Ch.
 Childers, Norman F. N.F.C.
 Chilver, Guy Edward Farquhar. G.E.F.C.
 Chin, Henk E. H.E.C.
 Chisholm, Lawrence James. L.J.C.
 Choay, Françoise. F.Ch.
 Chong, Byong-Wuk. B.-W.C.
 Chossudovsky, Michel. Mi.Ch.
 Chow, Christopher. Ch.C.
 Chow, Tse-tung. T.-t.C.
 Christensen, Aksel E. A.E.Cn.
 Christensen, Dieter. Di.C.
 Christensen, Jan. Ja.C.
 Christie, Andrew Barnett. A.B.C.
 Christie, Ian R. I.R.C.
 Chu, Steven. St.C.
 Chuang Shang-yen. C.S.-y.
 Ćirković, Sima M. S.M.Ci.
 Clagg, Sam E. S.E.C.
 Clarence-Smith, William Gervase. W.G.C.-S.
 Clark, Andrew F. A.F.C.
 Clark, Eugene. E.Cl.
 Clark, George B. G.B.Cl.
 Clark, Martha L. M.L.Cl.
 Clark, Martin. M.Cl.
 Clark, Walter Houston. W.H.C.
 Clarke, Colin Graham. C.G.C.
 Clarke, Donald C. D.C.C.
 Clarke, John Innes. J.I.C.
 Clarke, Margaret A. M.A.C.
 Clarke, Martin Lowther. M.L.C.
 Clarkson, Jesse Dunsmore. J.D.C.
 Classen, Peter. P.Cla.
 Clay, Theresa. T.C.
 Clayton, Raymond Brazenor. R.B.C.
 Clayton, Sir Stanley George. S.G.C.
 Clegern, Wayne M. W.M.Cl.
 Clemence, Gerald M. G.M.Ce.
 Clench, Mary Heimerdinger. M.H.C.
 Clifford, Derek Plint. D.P.Cl.
 Clifford, Paul R. P.R.Cd.
 Cline, Barbara Lovett. B.L.C.
 Cline, C.L. C.L.Cl.
 Cline, Howard F. H.F.C.
 Clingan, Ian C. I.C.C.
 Clogg, Richard Ralph Mowbray. R.R.M.C.
 Closs, Gerhard L. G.L.C.
 Clout, Hugh D. H.D.C.
 Clutton, Cecil. C.Cl.
 Coates, J.E. J.E.Co.
 Coates, Ken S. K.S.C.
 Cobbing, Julian R.D. J.R.D.C.
 Cochran, Thomas B. T.B.C.
 Cockshut, A.O.J. A.O.J.C.
 Coe, Michael Douglas. M.D.C.
 Cofer, Charles N. C.N.C.
 Coffin, David R. D.R.C.
 Coffin, Ivor Cecil. I.C.Cn.
 Cogley, John. Jo.C.
 Cogniat, Raymond. R.Cog.
 Cohen, Gerson D. G.D.C.
 Cohen, John Michael. J.M.Co.
 Cohen, Yehudi A. Y.A.C.
 Cohn, Paul M. P.M.C.
 Cole, Bruce. B.C.
 Cole, John N. J.N.C.
 Cole, Dame Margaret I. M.I.C.
 Coley, Noel G. N.G.C.
 Colley, Linda J. L.J.Co.
 Collins, George R. G.R.Co.
 Collins, James Daniel. J.D.Co.
 Collins, Nigel. N.Co.
 Collins, Peter. Pe.C.
 Collins, Philip. Ph.C.
 Collins, Robert O. R.O.C.
 Collison, Robert L. R.L.C.
 Collon, Dominique P.M. D.P.M.C.
 Comhaire, Jean L. J.Co.
 Conacher, Arthur J. A.J.C.
 Conlan, Kathleen Elizabeth. K.E.C.
 Conley, C. Lockard. C.L.C.
 Conn, J.F.C. J.F.C.C.
 Conn, Robert W. Ro.W.C.
 Connell, Timothy John. T.J.Co.
 Connor, Ralph A. R.A.Co.
 Conot, Robert E. R.E.Co.
 Conquest, Robert. Ro.C.
 Constable, William G. W.G.C.
 Conversi, Leonard W. L.C.
 Conway, Dennis. D.Co.
 Cook, Sir Alan H. A.H.C.
 Cook, David A. D.A.C.
 Cook, L. Russell. L.R.C.
 Cooke, Deryck V. D.V.Co.
 Cooks, Johann. Jo.Co.
 Coolhaas, W.Ph. W.Ph.C.
 Cooper, Douglas. D.C.
 Cooper, Kenneth H. K.H.C.
 Cooper, Martin Du Pré. M. Du P.C.
 Copeland, B. Jack. B.J.Co.
 Copp, J. Terry. J.T.C.
 Corbet, Philip S. P.S.C.
 Cordell, Dennis D. D.D.C.
 Cordner, Michael. M.Co.
 Corliss, John O. J.O.C.
 Cormack, Robin Sinclair. R.S.Co.
 Cornelius, Charles E. C.E.Co.
 Cornevin, Robert. R.Co.
 Cornwall, John L. J.L.C.
 Coser, Lewis A. L.A.C.
 Cosgrove, Denis E. D.E.C.
 Costa, José. J.Ca.
 Coste, René. R.C.
 Cotter, Charles Henry. C.H.C.
 Cottle, Richard W. R.W.Co.
 Cotton, F. Albert. F.A.C.
 Coulson, Noel James. N.J.C.
 Coulter, Colin. C.Co.
 Couper, Alastair Dougal. A.D.C.
 Courthion, Pierre. P.Co.
 Cousin, Jean. Je.C.
 Cowell-Myers, Kimberly. K.C.
 Cowen, Denis Victor. D.V.Cn.
 Cowgill, Warren. W.C.
 Cox, Hiden T. H.T.C.
 Cox, Maria S. M.S.C.
 Cox, Antony Dacres Hippisley. A.D.H.C.
 Crabb, David W. D.W.C.
 Cragg, The Rt. Rev. Albert Kenneth. A.K.C.
 Crampton, Richard J. R.J.C.
 Cranston, Maurice. M.C.

- Cratty, Bryant J. B.J.C.
 Crawshay-Williams, Rupert. R.C.-W.
 Creevey, Peter Raymond. P.R.C.
 Cremin, Lawrence A. L.A.Cr.
 Crews, Frederick C. F.C.C.
 Crist, Raymond E. R.E.Cr.
 Critchfield, Howard J. H.J.Cr.
 Crocombe, Marjorie Tuainekore. M.T.C.
 Crocombe, Ronald G. R.G.C.
 Croizier, Ralph C. R.C.C.
 Croll, Gerhard. G.Cr.
 Cromer, George C. G.C.C.
 Cromer, Orville C. O.C.C.
 Crompton, Robin Huw. R.H.C.
 Crone, Gerald Roe. G.R.C.
 Cronin, Vincent. V.C.
 Cronquist, Arthur. A.Cr.
 Crook, John Anthony. J.A.Cr.
 Crook, Keith A.W. K.A.W.C.
 Cross, H. Russell. H.R.C.
 Crossley-Holland, Peter. P.C.-H.
 Crow, Paul A., Jr. P.A.C.
 Crowley, John M. J.M.C.
 Crowley, The Rev. Theodore. T.Cr.
 Crowther, Bosley. B.Cr.
 Crowther, J.G. J.G.Cr.
 Cruickshank, John. J.Cr.
 Cruse, William. W.Cr.
 Crystal, Jill. J.C.
 Cucu, Vasile S. V.S.C.
 Cudworth, Charles. C.Cu.
 Cuffe, Michael. M.Cu.
 Culianu, Ioan Petru. I.P.C.
 Culican, William. W.Cu.
 Cullen, James. J.Cu.
 Current, Richard N. R.N.C.
 Curry, Glen D. G.D.Cu.
 Curtin, Nancy A. N.A.C.
 Curtis, Alan S. A.S.Cu.
 Curtis, Stanley Evan. S.E.Cu.
 Curtis, Stanley James. S.J.C.
 Cutbill, Catherine C. C.C.C.
 Cuthbert, Alan William. A.W.C.
 Cuttler, Charles D. C.D.Cu.

 Dacharry, Monique. M.Da.
 Daiches, David. D.Da.
 Dalley, Stephanie Mary. S.M.D.
 Dalstrom, Harl Adams. H.A.D.
 Daniel, Glyn Edmund. G.E.D.
 Daniel, Ralph Thomas. R.T.D.
 Daniell, Jere R. J.R.D.
 Daniels, Milton Rockwood. M.R.Da.
 Daniels, Robert V. R.V.D.
 Dansette, Adrien. A.Da.
 D'Antonio, William Vincent. W.V.D'A.
 Dantzig, George B. G.B.D.
 Danzig, Allison. A.D.
 D'Arcy, William G. W.G.D'A.
 Das, Hariprasanna. H.D.
 Das, Manmath Nath. M.N.D.
 Dashtseren, D. D.Dn.
 Dasmann, Raymond F. R.F.D.
 Dauster, Frank N. F.N.D.
 David, René. R.Da.
 Davidsohn, A.S. A.S.D.
 Davidson, Eugene A. E.A.D.
 Davidson, James Norman. J.N.D.
 Davidson, P. Michael. P.M.D.
 Davidson, Robert Bruce. R.B.D.
 Davies, Ernest Albert John. E.A.J.D.
 Davies, Hugh Alistair. H.A.Da.
 Davies, Norman. N.D.
 Davies, Oliver. O.D.
 Davies, Robert E. R.E.Da.

 Davies, Roger. Ro.D.
 Davies, The Rev. Rupert E. R.E.D.
 Davies, Thomas M., Jr. T.M.D.
 Davies-Mitchell, Margaret C. M.C.D.-M.
 Davis, H. Grady. H.G.D.
 Davis, Harry. Ha.D.
 Davis, M. Edward. M.E.D.
 Davis, Morton D. M.D.D.
 Davis, Richard A., Jr. R.A.D.
 Davison, W. Phillips. W.P.D.
 Davson, Hugh. H.Da.
 Dawbin, William Henry. W.H.D.
 Dawson, Andrew Hutchinson. A.H.D.
 Dawson, Mary R. M.R.D.
 Day, Michael H. M.H.D.
 Dayal, P. P.D.
 Dean, The Most Rev. Ralph Stanley. R.S.De.
 DeBakey, Michael E. M.E.DeB.
 Decalo, Samuel. S.De.
 Decker, Barbara B. B.B.De.
 Decker, Robert W. R.W.De.
 Decker, Scott. Sc.D.
 De Conde, Alexander. A. De C.
 de Graft-Johnson, John Coleman. J.C. de G.-J.
 de Grummond Thomson, Nancy. N.T. de G.
 Dekker, George G. G.De.
 de la Mare, Peter B.D. P.B.D. de la M.
 DeLancey, Mark W. M.W.DeL.
 Delano Smith, Catherine. C.D.S.
 Delevoryas, T. T.De.
 DeLong, Dwight Moore. D.M.DeL.
 Delporte, Henri J. H.J.De.
 Delsemme, Armand H. A.H.De.
 de Marly, Diana Julia Alexandra. D.J.A. de M.
 Dember, William N. W.N.D.
 Denbow, James R. J.R.De.
 Denecke, Ludwig. L.De.
 Denman, Hugh F. H.F.D.
 Dennis, Michael Aaron. M.A.D.
 Deraniyagala, Paul E. Pieris. P.E.P.D.
 Der Nersessian, Sirarpie. S. Der N.
 Desai, Ranjit Ramchandra. R.R.D.
 Desan, Wilfrid. W.De.
 Descargues, Pierre. P.De.
 Deschamps, Hubert Jules. H.J.D.
 Desforges, Jane F. Ja.F.D.
 Desmond, Adrian J. A.J.De.
 Despić, Aleksandar R. A.De.
 Desrosier, Norman Wilfred. N.W.D.
 Dethan, Georges. G.Det.
 de Vleeschauwer, Herman Jean. H.J. de V.
 Devlin, John F. J.F.De.
 De Vorse, Louis. L. De V.
 Dewdney, John C. J.C.D.
 DeWoskin, Kenneth J. K.J.DeW.
 Diakonoff, Igor Mikhailovich. I.M.D.
 Diano, Carlo. C.D.
 Dibner, Bern. B.Di.
 Dickie, James. J.Di.
 Dickinson, Harry T. H.T.D.
 Dickson, William C. W.C.D.
 Dickson, Kwamina Busumafi. K.B.D.
 Dickson, M. Gary. M.G.D.
 Dickstein, Morris. M.Di.
 Diem, Aubrey. A.Di.
 Dienst, Heide. H.Di.
 Diethrich, Edward Bronson. E.B.D.
 Dietrich, R.V. R.V.Di.
 Dietz, John L. J.L.Di.
 Diffloth, Gérard. G.Di.
 Dijkgraaf, Sven. S.Di.
 Dikshit, K.R. K.R.D.

 Dilcher, David L. D.L.Di.
 Dilger, William C. W.C.Di.
 Dillon, Myles. M.D.
 Dimitrov, Philip. Ph.Di.
 Dimitrovsky, Haim Zalman. H.Z.D.
 Dimock, Edward C., Jr. E.C.D.
 Diószegi, Vilmos. V.D.
 Di Palma, Giuseppe. G. Di P.
 Dipert, Randall R. R.R.Di.
 Diringer, David. D.D.
 Ditchburn, Robert William. R.W.Di.
 Djibladze, Mikhail Leonidovich. M.L.D.
 Dobzhansky, Theodosius. T.D.
 Dockstader, Frederick J. F.J.D.
 Dodson, Calaway H. C.H.D.
 Domanitsky, Anatoly Petrovich. A.P.D.
 Domb, Cyril. Cy.Do.
 Domingues, Mário José. M.J.D.
 Domke, Martin. M.Do.
 Dommen, Arthur J. A.J.D.
 Donahue, Charles, Jr. Ch.D.
 Donald, David Herbert. D.H.D.
 Donald, Larry W. L.W.D.
 Doniger, Wendy. W.Do.
 Donini, Filippo. F.Do.
 Donnellan, Keith S. K.S.D.
 Donovan, Bernard Thomas. B.T.D.
 Dooling, David, Jr. Da.D.
 Dorfman, Robert. R.D.
 Dorfman, Ron. R.Do.
 Doroshinskaya, Yelena Matveyevna. Y.M.D.
 Dorpalen, Andreas. A.Do.
 Dorson, Richard M. R.M.D.
 Dorst, Jean P. J.P.D.
 Dorwick, Keith. K.D.
 Doucy, Arthur J.M. Ar.D.
 Douglas, A. Vibert. A.V.D.
 Douglas, Ronald Walter. R.W.D.
 Douie, Decima L. D.L.D.
 Dowd, Douglas F. D.F.Do.
 Dowdey, Clifford. C.Do.
 Dowling, Herndon G. H.G.Do.
 Downing, James H. J.H.D.
 Dowsett, Charles James Frank. C.J.F.D.
 Doyle, Larry James. L.J.D.
 Drachman, Angeliki Malikouti- A.M.-D.
 Drake, Paul W. P.W.D.
 Dresch, Jean. Je.D.
 Drescher, Seymour. S.Dr.
 Dresden, Mark J. M.J.Dr.
 Drew, Philip. Ph.D.
 Drinkwater, John Frederick. J.F.Dr.
 Driscoll, John S. J.S.D.
 Drobnig, Ulrich M. U.M.D.
 Drower, Margaret Stefana. M.S.D.
 Drucker, Philip. P.Dr.
 Drummond, Boyce A., Jr. B.A.D.
 D'Souza, Harry J. H.J.D'S.
 Dubois, Carlos Pablo. C.P.D.
 Duchesne-Guillemin, Jacques. J.D.-G.
 Duckett, Eleanor Shipley. E.S.D.
 Dudley, Donald Reynolds. D.R.D.
 Due, John F. J.F.D.
 Duellman, William E. W.E.D.
 Dufford, Stanley. S.P.
 Duggan, Lawrence G. L.G.D.
 Duiker, William J. W.J.D.
 Dull, Jack L. J.L.D.
 Dulles, The Rev. Avery. A.Du.
 Dumesnil, René. R.Dum.
 Dummett, Michael A.E. Mi.D.
 Dumond, Don E. D.E.D.
 Dunbar, Maxwell John. M.J.Du.
 Dunbar, Moira. M.Dr.
 Dunn, Ethel Deikman. E.D.D.

- Dunn, L.C. L.C.D.
 Dunn, Richard S. R.S.Du.
 Dunn, Stephen Porter. S.P.D.
 Dupree, Louis. L.Du.
 Dupree, Nancy Hatch. N.H.D.
 Duran, Manuel E. M.E.Du.
 Durant, Frederick C., III. F.C.D.III.
 Durnat, Raymond E. R.Du.
 Durko, Janusz. Ja.D.
 Dury, George Harry. G.H.D.
 Dussel, Enrique. E.Du.
 Dutt, Ashok K. A.K.D.
 Duveen, Denis Ian. D.I.D.
 Duverger, Maurice. M.Du.
 Duxbury, Alyn C. A.C.D.
 Dworken, Harvey J. H.J.Dw.
 Dyck, Cornelius J. C.J.D.
 Dyer, Denys G. D.G.D.
 Dykeman, Wilma. W.D.
 Dykhuizen, George. G.Dy.
- Eardley, Armand J. A.J.E.
 Earl, David Magarey. D.M.Ea.
 Early, Gerald. G.Ea.
 Easby, Dudley Tate, Jr. D.T.E.
 East, W. Gordon. W.G.E.
 Eastman, Richard H. R.H.E.
 Easton, Archie H. A.H.E.
 Easton, The Rev. Donald Fyfe. D.F.E.
 Ebanks, Elizabeth Pat. E.P.E.
 Ebisawa, Arimichi. A.Eb.
 Ebling, F. John G. F.J.G.E.
 Eccles, W.J. W.J.E.
 Echenberg, Myron. M.Ec.
 Eckbo, Garrett. G.Ec.
 Eckenwalder, James Emory. J.E.Ec.
 Ede, David A. D.E.
 Edel, Leon. L.Ed.
 Edelmann, Chester Monroe, Jr. C.M.E.
 Edge, Ian David. I.D.E.
 Edlin, Herbert Leeson. H.L.E.
 Edwards, Richard Humphrey
 Tudor. R.H.T.E.
 Edwards, Robert Walter
 Dudley. R.W.D.E.
 Edzard, Dietz O. D.O.E.
 Egerod, Søren Christian. S.C.E.
 Eggen, Olin Jeuck. O.J.E.
 Egli, Emil. E.Eg.
 Ehlers, Ernest G. E.G.E.
 Ehrich, Fredric F. F.F.E.
 Ehrlich, Blake. B.E.
 Eidt, Robert C. R.C.Ei.
 Eilon, Samuel. S.E.
 Ekstrom, George F. G.F.E.
 Elath, Eliahu. E.E.
 Elbow, Gary S. G.S.E.
 Elekes, Lajos. L.El.
 El Hamamsy, Laila Shukry. L.S.El H.
 Eliade, Mircea. M.Ee.
 El-Kammash, Magdi M. M.M.El-K.
 Elkins, Thomas Henry. T.H.El.
 Eller, Ernest McNeill. E.McN.E.
 Elliot, Lorraine M. L.M.E.
 Elliott, David H. D.H.E.
 Elliott, Sir Ivo D'Oyly. I.D'O.E.
 Elliott, Robert C. R.C.E.
 Ellis, E. Earle. E.E.E.
 Ellis, Joseph John. Jo.E.
 Ellis, Peter. P.E.
 Elsen, Albert Edward. A.E.El.
 Elton, Sir Geoffrey R. G.R.E.
 Emerit, Marcel. M.E.
 Emery, Walter. W.Em.
 Emmerick, Ronald Eric. R.E.E.
- Enander, Henrik. H.En.
 Endress, Peter K. P.K.E.
 Enfield, David B. D.B.En.
 Engberg, Jens. J.E.
 Engerrand, George C. G.C.E.
 Englekirk, John E. J.E.E.
 Enrico, Eugene J. E.J.E.
 Epperson, Gordon. G.E.
 Epstein, William. W.E.
 Erb, Donald James. D.Er.
 Erb, Hubert Joseph. H.J.Er.
 Erben, Walter. W.Er.
 Ericson, David Barnard. D.B.E.
 Erlanger, Philippe. P.Er.
 Erpelding, Jean-Pierre. J.-P.E.
 Erulkar, Solomon D. S.D.E.
 Escarpit, Robert. R.Es.
 Escholier, Marc Marie. M.M.E.
 Eskenazi, Gerald. G.Es.
 Ess, Josef van. J.v.E.
 Esslin, Martin J. M.J.E.
 Estabrook, Leigh S. L.S.E.
 Eulau, Heinz. H.E.
 Euler, Heinrich Gustav. H.G.E.
 Evans, Graham. G.Ev.
 Evans, Dame Joan. J.Ev.
 Evans, Luther Harris. L.H.E.
 Evans, M. Albert. M.A.E.
 Evenson, Edward B. E.B.E.
 Everard, Cyril Ernest. C.E.E.
 Everett, Richard W. R.W.E.
 Everett, Thomas H. T.H.E.
 Every, Brother George. Ge.E.
 Ewald, Paul P. P.P.E.
 Eyring, Henry. H.Ey.
 Ezell, Edward C. E.C.E.
 Ezell, John S. J.S.E.
- Faarlund, Jan Terje. J.T.F.
 Faber, Thomas E. T.E.F.
 Fadiman, Clifton. C.Fa.
 Fage, John D. J.D.F.
 Fagg, John E. J.E.F.
 Faherty, Robert L. R.F.
 Fairbridge, Rhodes W. R.W.F.
 Falkenheim, Victor C. V.C.F.
 Faller, James E. Ja.F.
 Faller, Larry D. L.D.F.
 Faris, Nabih Amin. N.A.F.
 Faris, Robert E.L. R.E.L.F.
 Faron, Louis C. L.C.F.
 Faubion, James. J.F.
 Faulkner, Raymond Oliver. R.O.F.
 Faust, Clarence Henry. C.H.F.
 Fautin, Daphne Gail. D.G.Fa.
 Fawcett, Don W. D.W.F.
 Fedan, Jeffrey S. J.S.F.
 Fedorovich, Boris Aleksandrovich. B.A.F.
 Fefferman, Charles L. C.L.F.
 Feigin, Ralph D. R.D.F.
 Feigl, Herbert. H.Fe.
 Feigon, Lee Nathan. L.N.F.
 Feldman, Louis H. L.H.F.
 Fellman, David. D.Fe.
 Fellner, Fritz. F.Fe.
 Felteau, Cyrille. C.Fe.
 Fennell, John Lister Illingworth. J.L.I.F.
 Ferdinandy, Michael de. M. de F.
 Ferguson, John. J.Fe.
 Fermín Gómez, Mercedes. Me.F.G.
 Fernald, John Bailey. J.B.F.
 Fernandez, James W. J.W.Fe.
 Fernier, Robert J. R.J.F.
 Ferreira, C.E. C.E.F.
 Feuer, Lewis S. L.S.F.
- Feuerwerker, Albert. A.Fe.
 Fieandt, Kai V.J. von. K.V.J.v.F.
 Fiegenbaum, J.W. J.W.F.
 Field, Andrew. A.Fi.
 Fielding, Raymond E. R.E.Fi.
 Fifer, J. Valerie. J.V.F.
 Filliozat, Jean L.A. J.L.A.F.
 Findley, James Smith. J.Fi.
 Finer, Samuel Edward. S.E.F.
 Fink, Donald G. D.G.F.
 Finkbeiner, Daniel T., II. D.T.F.
 Finley, Robert W. Ro.W.F.
 Firth, Sir Raymond William. R.W.Fi.
 Fischer, John L. J.L.Fi.
 Fischler, Shirley W. S.W.Fi.
 Fischler, Stanley I. S.I.F.
 Fisher, David E. D.E.F.
 Fisher, Marshall Jon. M.J.F.
 Fisher, William B. W.B.Fi.
 Fisher, William W. W.W.F.
 Fishman, Alfred P. A.P.F.
 Fiske, Donald W. D.W.Fi.
 FitzGerald, Charles Patrick. C.P.F.
 Fitzgerald, Ross. R.Fi.
 Flannery, Timothy Fridtjof. T.F.F.
 Flannery-Herzfeld, Regina. R.F.-He.
 Flaum, Thea K. T.K.F.
 Fleming, Richard Howell. R.H.Fi.
 Fleming, William. Wm.F.
 Flemion, Philip F. P.F.F.
 Fletcher, Angus Stewart. A.S.F.
 Fletcher, Brian Hinton. B.H.F.
 Fletcher, Joseph O. J.O.Fi.
 Fletcher, Ronald. R.Fi.
 Flew, Antony Garrard Newton. A.G.N.F.
 Flint, Valerie I.J. V.I.J.F.
 Florinsky, Michael T. M.T.F.
 Florkin, Marcel. M.Fl.
 Flower, John E. Jo.E.F.
 Flusser, David. D.Fl.
 Fogelson, Raymond D. R.D.Fo.
 Folk, Robert Louis. R.L.F.
 Folkenflik, Robert. R.Fo.
 Folkerts, Menso. Me.F.
 Fomerand, Jacques F. J.F.F.
 Fomin, Luch Mikhaylovich. L.M.F.
 Fonash, Raymond T. R.T.F.
 Fonash, Stephen Joseph. S.J.F.
 Foner, Philip S. P.S.F.
 Foot, John. J.Ft.
 Foot, Michael Richard Daniell. M.R.D.F.
 Force, Roland Wynfield. R.W.Fo.
 Ford, Arthur B. A.B.Fo.
 Forde, Enid R.A. E.R.A.F.
 Fordham, Frieda. F.Fo.
 Fordham, Michael S.M. M.S.M.F.
 Formo, Marvin W. M.W.F.
 Forsdyke, Sir Edgar John. E.J.F.
 Forsythe, Gary Edward. G.E.Fo.
 Foskett, Douglas John. D.J.F.
 Foss, Lukas. L.Fo.
 Fought, Stephen Oliver. S.O.F.
 Foulkes, David. D.F.
 Fournier, Gabriel. G.Fo.
 Fowler, Catherine S. C.S.F.
 Fowler, Don D. D.D.F.
 Fowler, Gary L. G.L.F.
 Fowler, Murray. M.Fo.
 Fowlie, Wallace. W.F.
 Fox, David John. D.J.Fo.
 Fox, Denis Llewellyn. D.L.F.
 Fox, Michael W. M.W.Fo.
 Fox, Richard G. R.G.F.
 Fox, Sidney W. S.W.F.
 Fraenkel, Heinrich. H.Fra.
 Fraisse, Paul. P.F.

- Francis, Sir Frank C. F.C.F.
Franciscono, Marcel. M.I.F.
Frank, Peter W. P.W.F.
Frank, W.J. W.J.F.
Franke, Herbert. H.Fr.
Frankel, Joseph. J.Fr.
Frankel, Marvin. Ma.F.
Franzius, Enno. E.F.
Fraser, Lady Antonia. A.Fr.
Fraser, Craig G. C.G.F.
Fraser, Peter Marshall. P.M.F.
Frederick, William H. W.H.F.
Fredericksen, Linwood. L.F.
Freeborn, Richard H. R.H.Fr.
Freedman, Lawrence D. L.D.Fr.
Freeman, Charles W. C.W.F.
Freeman-Grenville, Greville Stewart
Parker. G.S.P.F.-G.
Frei, Hans Wilhelm. H.W.Fr.
Freiberger, Paul A. P.A.F.
Freidel, Frank. F.Fr.
Freihofer, Warren Curtis. W.C.F.
French, Richard Antony. R.A.F.
Frend, The Rev. William Hugh
Clifford. W.H.C.F.
Frere, Sheppard Sunderland. S.S.F.
Freund, Michael. M.Fr.
Frey, Richard L. R.L.Fr.
Fridovich, Irwin. I.Fr.
Fridovich-Keil, Judith L. J.L.F.-K.
Frieden, Ken. K.F.
Friedlander, Rabbi Albert H. A.H.F.
Friedlander, Michael Wulf. M.W.Fr.
Friedman, Albert B. A.B.F.
Friedman, Milton. M.Fr.
Friedman, Norman. N.F.
Friedmann, Arnold A. A.A.F.
Friedmann, Herbert. He.F.
Friedmann, Marion Valerie. M.V.F.
Friedrich, Hermann. H.F.
Friermood, Harold T. H.T.F.
Friis, Astrid. As.F.
Frings, Hubert William. H.W.F.
Frings, Manfred S. M.F.S.
Frith, Simon. S.F.
Fritz, Kurt von. K.v.Fr.
Fritzsche, Hellmut. Ht.F.
Froelich, Jean Claude. J.C.F.
Froeschner, Richard Charles. R.C.F.
Froning, Glenn W. G.W.F.
Frost, David B.J. D.B.J.F.
Fryde, Edmund B. E.B.Fr.
Frye, Richard N. R.N.F.
Fuehsel, Charles F. C.F.F.
Fuglestad, Finn. F.F.
Fuhrman, Ralph E. R.E.F.
Fujimura Michio. Fu.M.
Fu-Kiau kia Bunseki-L., André. A.Fu.
Fuller, Edmund. E.Fu.
Furie, Bruce. B.Fu.
Fuson, Robert H. R.H.Fu.
Fussell, George Edwin. G.E.F.
Fyfe, Christopher. C.Fy.
Fyfe, William S. W.S.F.
- Gabel, Matthew J. M.J.Ga.
Gadd, Cyril John. C.J.Ga.
Gade, Daniel W. D.W.Ga.
Gailey, Harry A. H.A.G.
Galazy, Grigory Ivanovich. G.I.G.
Gallager, Robert G. R.G.G.
Gallaher, John G. J.G.G.
Galli, Rosemary Elizabeth. R.E.Ga.
Gamble, David P. D.P.Ga.
Gamer, Carlton. Ca.G.
- Gamkrelidze, Thomas V. Th.V.G.
Ganellin, C. Robin. C.R.G.
Gantt, W. Horsley. W.H.G.
Garavito, Clemente. C.Ga.
García-Gómez, Angel M. A.M.G.-G.
Gardiner, Patrick Lancaster. P.L.G.
Gardinier, David E. D.E.G.
Gardiner, Robert K.A. R.K.A.G.
Gardner, Dame Helen. Hn.G.
Garg, Renu. Re.G.
Gargi, Balwant. B.Ga.
Garigue, Philippe. P.Ga.
Garland, George D. G.D.G.
Garn, Stanley M. S.M.G.
Garner, Hesse Filmore. H.F.G.
Garrett, Alfred B. A.B.Ga.
Garrigus, Wesley Patterson. W.P.G.
Gash, Norman. N.G.
Gasking, Elizabeth Belmont. E.B.G.
Gasparini, Evel. E.G.
Gaster, Theodor H. T.H.G.
Gates, David M. D.M.G.
Gaunt, William. W.Ga.
Gavrilov, Aleksandr
Mikhaylovich. A.M.Ga.
Geanakoplos, Deno John. D.Ge.
Gear, Charles William. C.W.Ge.
Geary, Patrick J. P.J.G.
Gebhard, Paul Henry. P.H.Ge.
Geerlings, Gerald K. G.K.Ge.
Gehring, Jean Marie. J.M.G.
Geiger, Pedro P. P.P.G.
Geiringer, Karl. K.G.
Gelb, Arthur. A.Ge.
Gelb, Barbara. B.Ge.
Gelb, Ignace J. I.J.G.
Gelderman, Carol W. C.W.G.
Gelpi, Ettore. E.Ge.
Gelston, Arthur S., Jr. A.S.G.
Gent, Alan N. A.N.G.
Gentili, Joseph. J.G.
Gentry, Alan William. A.W.G.
Genuth, Saul. S.Ge.
Gerasimov, Innokentii Petrovich. I.P.G.
Gerber, Philip L. P.L.Ge.
Gergely, John. J.Ge.
Germani, Gino. G.Ge.
Gernsheim, Helmut Erich
Robert. H.E.R.G.
Gerow, Edwin. Ed.G.
Gerteiny, Alfred G. A.G.G.
Gertsch, Willis John. W.J.G.
Geyer, Richard A. R.A.G.
Ghirshman, Roman. R.Gh.
Ghiselin, Michael T. M.T.G.
Ghori, G.K. G.K.G.
Ghose, Sisirkumar. S.Gh.
Ghul, Mahmud Ali. M.A.G.
Gibb, Andrew Dewar. A.D.G.
Gibbins, Roger. R.G.
Gibbons, Gary William. G.W.G.
Gibbons, James L. J.L.Gi.
Gibbs, Frederick William. F.W.G.
Gibbs-Smith, Charles Harvard. C.H.G.-S.
Gibney, Frank B. F.B.G.
Gibson, McGuire. McG.G.
Gibson, Robert Donald
Davidson. R.D.D.G.
Giddings, J. Calvin. J.C.Gi.
Gies, Frances Carney. F.C.Gi.
Gifford, Ernest M. E.M.G.
Gilbert, Bentley Brinkerhoff. B.B.G.
Gilbert, Creighton E. C.E.G.
Gilbert, Douglas Stuart. D.Gi.
Gilbert, Robert Andrew. R.A.Gi.
Gilchrist, Peter Spence, Jr. Pe.S.G.
- Giles, James R. J.R.G.
Gill, Charles Burroughs. C.B.G.
Gill, The Rev. Joseph. J.Gi.
Gillies, Alexander. A.Gi.
Gillmeister, Heiner. H.Gi.
Gillmor, Reginald E. R.E.Gi.
Gilmore, Robert Louis. R.L.Ge.
Gimbutas, Marija. M.G.
Gimm, Martin. M.Gi.
Gingerich, Owen. O.G.
Ginsberg, Donald M. D.M.Gi.
Ginsburg, Norton S. N.S.G.
Giorgetti, Giovanni Pietro. G.P.Gi.
Girault, Christian Antoine. C.A.G.
Girifalco, Louis A. L.A.G.
Girvetz, Harry K. H.K.G.
Gjuzeev, Wassil Todorov. W.T.G.
Glasz, Christiaan. C.G.
Glatzer, Nahum N. N.N.G.
Glazer, Sidney. S.Gi.
Gleck, James. J.Gi.
Glendon, Mary Ann. M.A.Gi.
Glubb, Sir John Bagot. J.B.Gi.
Godbey, John Charles. J.C.G.
Godechot, Jacques. J.Go.
Godman, Michael James. M.J.G.
Godman, Peter. P.Go.
Goethals, Peter R. P.R.Go.
Goetz, Hermann. H.Go.
Gogolák, Ludwig von. L.v.G.
Goldammer, Kurt Moritz
Artur. K.M.A.G.
Goldbeck, Frederick. F.Go.
Goldblatt, Howard C. H.C.G.
Goldblatt, Peter. Pe.G.
Goldin, Judah. J.Gol.
Goldscheider, Ludwig. L.Go.
Gomillion, Charles Goode. C.G.G.
Gomme, Arnold Wycombe. A.W.Ge.
Gömöri, George. G.G.
Goncharov, Vladimir Petrovich. V.P.G.
González, Nancie L. N.L.G.
González Diaz, Emilio
Fernando. E.F.G.D.
Goode, Richard B. R.B.G.
Goodman, Morris F. M.F.Go.
Goodner, John Ross. J.R.Go.
Goodnight, Marie Louise. M.L.Go.
Goodsell, James Nelson. J.N.G.
Goodstein, David L. D.L.G.
Goodwin, Albert. Al.G.
Goodwin, Frank E. F.E.G.
Goodwin, Noël. N.Go.
Gopnik, Adam. A.Go.
Gordon, Arnold L. A.L.G.
Gordon, Burton L. B.L.G.
Gordon, Cyrus H. C.H.G.
Gordon, David Frank. D.F.G.
Gordon, George N. G.N.G.
Gordon, Isabella. I.G.
Gorgy, Samy. S.G.
Görlitz, Walter Otto Julius. W.Go.
Gorman, George C. G.C.G.
Goss, Richard Johnson. R.J.G.
Gottschalk, Stephen. S.Go.
Goult, Herman W. H.W.G.
Gourou, Pierre. P.Gu.
Gowans, Alan. Al.Go.
Gowing, Sir Lawrence. La.G.
Grabar, Oleg. O.Gr.
Graf, Alfred Byrd. A.B.Gr.
Graham, Hugh F. H.F.Gr.
Grame, Theodore C. T.Gr.
Grancsay, Stephen Vincent. S.V.G.
Grant, Michael. M.Gr.
Grant, Robert M. R.M.G.

- Graue, Jerald C. J.C.Gr.
 Gray, Alic William. A.W.Gr.
 Gray, Eric William. E.W.G.
 Gray, Jeremy John. J.J.G.
 Graybeal, Jack D. J.D.G.
 Grayling, A.C. A.C.G.
 Grayson, Kent A. K.A.G.
 Greaves, Malcolm W. M.W.G.
 Green, Edna R. E.R.G.
 Green, James. J.Gr.
 Green, Reginald Herbold. R.H.Gr.
 Green, Roger Lancelyn. R.L.G.
 Greenaway, Frank. F.Gr.
 Greenberg, Moshe. Mo.Gr.
 Greenblatt, Stephen J. S.J.G.
 Greene, David. D.Gr.
 Greene, Mark Richard. M.R.G.
 Greenfield, Richard David. Ri.G.
 Greenwood, Peter Humphry. P.H.G.
 Greenwood, Richard Harold. R.H.G.
 Greer, Charles E. C.E.Gr.
 Gregg, Alan. Al.Gr.
 Gregoriotti, Guido. G.Gr.
 Grenville, John A.S. J.A.S.G.
 Gressitt, Judson Linsley. J.L.G.
 Griffin, Ernst C. E.C.G.
 Griffith, Guy Thompson. G.T.G.
 Griffith, William J. W.J.Gr.
 Griffiths, Anthony J.F. A.J.F.G.
 Grim, Ralph E. R.E.G.
 Grimm, Frankdieter. F.G.
 Grimsley, Ronald. R.Gr.
 Gritzner, Jeffrey Allman. J.A.G.
 Groen, Pier. P.Gr.
 Groover, Mikell P. M.P.G.
 Gross, Harvey S. Ha.G.
 Grove, Alfred Thomas. A.T.G.
 Groves, Colin Peter. C.P.G.
 Grudin, Robert. Ro.G.
 Gruffud, R. Pyrs. R.P.G.
 Grünbaum, Branko. B.G.
 Gruner, Holger. H.Gr.
 Gudava, T.E. T.E.G.
 Guenther, Herbert V. H.G.
 Guerello, The Rev. Franco. F.Gu.
 Guiart, Jean. J.Gt.
 Guichonnet, Paul. P.G.
 Guiguemde, Pierre H. P.H.Gu.
 Guillemin, Henri. He.Gu.
 Guilmartin, John F., Jr. J.F.G.
 Guimarães, Alberto Passos. A.P.G.
 Guitton, Henri. H.Gu.
 Gulyans, Peteris V. P.V.G.
 Gundermann, Karl-Dietrich. K.-D.G.
 Gungaadash, B. B.Gu.
 Gunner, Elizabeth Anne Wynne. E.A.W.G.
 Gunther, Erna. E.Gu.
 Gurney, Ashley B. A.B.G.
 Gurney, Oliver Robert. O.R.G.
 Gusdorf, Georges Paul. G.P.G.
 Gustafson, Neil C. N.C.G.
 Güterbock, Hans G. H.G.G.
 Guthertz, Elmer J. E.J.G.
 Guthrie, Douglas James. D.J.G.
 Guthrie, Sir Tyrone. T.G.
 Gutmann, Viktor. V.G.
 Guttman, Allen. A.G.
 Guy, J.J. J.J.Gu.
 Gvozdetzky, Nikolay
 Andreyevich. N.A.G.
 Gwynn, Denis Rolleston. D.R.G.
 Gyllensvärd, Bo Vilhelm. B.V.Gy.
- Hackett, John. Jo.Hac.
 Haedeke, Hanns-Ulrich. H.-U.H.
 Haekel, Josef. Jo.H.
 Hafner, James A. Ja.A.H.
 Haggerty, James J. J.J.Ha.
 Haglund, David G. D.G.H.
 Hahn, Bae-ho. B.-h.H.
 Haight, Gordon S. G.S.Ha.
 Haines, Duane E. D.E.H.
 Hajda, Lubomyr A. L.A.H.
 Haldon, John Frederick. J.F.H.
 Haley, K.H.D. K.H.D.H.
 Halfpenny, Eric. E.Hy.
 Hall, Mark. Mk.H.
 Hall, Marshall, Jr. Ma.H.
 Hall, Martin. M.Hl.
 Hall, Robert A., Jr. R.A.H.
 Halperin Donghi, Tulio. T.H.D.
 Halpern, Jack. J.Ha.
 Halstead, Bruce W. B.W.H.
 Hambly, Gavin R.G. G.R.G.H.
 Hamelin, Louis-Edmond. L.-E.H.
 Hamerow, Theodore S. T.S.H.
 Hamidé, Abdul-Rahman. A.-R.H.
 Hamilton, Bernice Margaret. B.M.H.
 Hamilton, William James. W.J.H.
 Hamman, The Rev. Adalbert G. A.G.Ha.
 Hammen, Oscar J. O.J.H.
 Hammer, A. Gordon. A.G.H.
 Hammond, Mason. M.Ha.
 Hammond, Nicholas G.L. N.G.L.H.
 Hammond, Wayne G. W.G.H.
 Hammond Innes, Ralph. R.H.I.
 Hamp, Eric P. E.P.H.
 Hanahan, Donald J. D.J.H.
 Hand, Cadet H., Jr. C.H.Ha.
 Handlin, Oscar. O.H.
 Handzo, Stephen G. S.G.H.
 Hanna, Willard A. W.A.Ha.
 Hansen, Arlen J. A.J.H.
 Hansen, Gladys Cox. G.C.Ha.
 Hanson, Carl. C.Ha.
 Hanson, Earl Dorchester. E.D.H.
 Harbaugh, John W. J.W.Ha.
 Harbison, Craig S. C.S.Ha.
 Hardy, Sir Alister C. A.C.Ha.
 Hardy, Edward R. E.R.Ha.
 Hare, F. Kenneth. F.K.H.
 Hargrave, John G. J.G.H.
 Hargreaves, John D. J.D.H.
 Harland, David M. D.M.H.
 Harler, Campbell Ronald. C.R.H.
 Harmel, Claude. C.H.
 Harmon, Mamie. Ma.Ha.
 Harms, Robert Thomas. R.T.H.
 Harper, Peggy. P.H.
 Harpster, Joseph W. J.W.H.
 Harrelson, Walter. W.Ha.
 Harris, Chauncy D. C.D.H.
 Harris, David Russell. D.R.Ha.
 Harris, Enriqueta. E.Ha.
 Harris, James T. J.T.H.
 Harris, Leslie. L.H.
 Harris, Rosemary Lois. R.L.Ha.
 Harrison, John A. J.A.Ha.
 Harrison, Raymond O. R.O.H.
 Harrison, Sir Richard J. R.J.Ha.
 Harrison, Richard John. Ri.J.Ha.
 Harrison-Church, Ronald
 James. R.J.H.-C.
 Harriss, C. Lowell. C.L.Ha.
 Harrod, Sir Roy Forbes. R.F.H.
 Harroy, Jean-Paul. Je.-P.H.
 Hart, Herbert Lionel Adolphus. H.L.A.H.
 Hartenberg, Richard S. R.S.H.
 Hartley, Sir Frank. Fr.H.
- Hashisaki, Joseph. Jo.Ha.
 Hassler, Warren W., Jr. W.W.H.
 Hastings, Margaret. M.Has.
 Hathaway, Richard J. Ri.J.H.
 Hattingh, Phillip S. P.S.Ha.
 Hatton, Ragnhild Marie. R.M.H.
 Haugen, Einar. Ei.H.
 Hauner, Milan. Mi.Ha.
 Haurowitz, Felix. F.Ha.
 Häuser, Karl H. K.Hä.
 Hauser, Thomas. T.H.
 Hauss, Charles. Ch.Ha.
 Havelock, Eric Alfred. E.A.Ha.
 Haverschmidt, François. F.H.
 Havighurst, Robert J. R.J.H.
 Hawkins, Gerald S. G.S.H.
 Hawkins, Joseph E. J.E.H.
 Hawting, G.R. G.R.H.
 Hayashi, Shigeru. Sh.H.
 Hayashi, Takao. T.Hy.
 Hayes, J.M. J.M.Ha.
 Hayford, Charles W. C.W.H.
 Hayne, David M. D.M.Ha.
 Haynes, Robert R. R.R.H.
 Hayward, Charles Harold. C.H.H.
 Hayward, John F. J.F.Ha.
 Haywood, John A. J.A.H.
 Hazai, Georg. G.Ha.
 Hazard, John N. J.N.H.
 Hazen, Robert M. R.M.Ha.
 Hazzard, Shirley. Sh.Ha.
 Healy, Nicholas Joseph. N.J.H.
 Heaney, Robert Proulx. R.P.He.
 Heath, Donald Albert. Do.A.H.
 Heath, Dwight B. D.B.H.
 Heather, Peter John. P.J.He.
 Heaton, Pauline. Pa.H.
 Hebbert, Michael John. M.J.H.
 Hecht, Melvin E. M.E.H.
 Hedley, Arthur. A.Hy.
 Heelan, Patrick Aidan. P.A.H.
 Heerden, Ernst van. E.v.H.
 Heezen, Bruce C. B.C.H.
 Heiber, Helmut. H.Hei.
 Heilbron, John L. J.L.He.
 Heilbronner, Robert L. R.L.He.
 Heinemeyer, Walter. W.He.
 Heinen, Heinz. He.H.
 Helck, Wolfgang. W.H.
 Held, Julius S. Ju.H.
 Hellie, Richard. R.He.
 Helmfrid, Staffan. St.H.
 Hempel, Carl G. C.G.H.
 Henderson, David W. D.W.H.
 Henderson, Philip Prichard. P.P.H.
 Henderson, Robert M. R.M.He.
 Hendricks, George. G.He.
 Hendrickson, James B. J.B.He.
 Hendy, Sir Philip. P.He.
 Henfrey, Norman V. N.V.He.
 Henriksson, Markku Ilmari. M.I.He.
 Hensel, Herbert. H.He.
 Henson, Ronald A. R.A.He.
 Herbst, Stanislaw. S.He.
 Herde, Peter. Pe.He.
 Herivel, John. J.He.
 Herklots, Geoffrey A.C. G.A.C.H.
 Herlihy, David. D.He.
 Herman, Robert D. R.D.H.
 Hermans, Theo Jozef. T.J.H.
 Hero, Alfred O., III. A.O.H.III.
 Herrin, Judith Eleanor. J.E.He.
 Herschdoerfer, Sigismund M. S.M.H.
 Hertzberg, Rabbi Arthur. Ar.H.
 Herzfeld, Hans. Ha.He.
 Herzog, Gregory F. G.F.H.
- Haaf, Ernst ten. E.t.H.
 Haar, Dirk ter. D.t.H.

- Herzog, Marvin Irving. M.I.H.
 Herzog, Peter E. P.E.H.
 Heslinga, Marcus Willem. M.W.H.
 Heslop, D. Alan. D.A.He.
 Heslop-Harrison, John. J.H.-H.
 Hess, Eckhard H. E.H.H.
 Heston, The Most Rev. Edward Louis. E.L.H.
 Heydenreich, Ludwig Heinrich. L.H.H.
 Heyerdahl, Thor. Th.H.
 Hezel, The Rev. Francis X. F.X.H.
 Hibbard, Howard H.Hi.
 Hibbard, Jonathan D. Jo.D.H.
 Hibbert, Christopher. C.Hi.
 Hick, John. J.Hi.
 Hickey, Gerald C. G.C.H.
 Hieatt, A. Kent. A.K.H.
 Higginbotham, Jay. Ja.H.
 Higgins, David J.M. D.J.M.H.
 Higgins, Reynold Alleyne. R.A.Hi.
 Higgs, Eric S. E.S.H.
 Highet, Gilbert. G.Hi.
 Highfield, J.R.L. J.R.L.H.
 Highsmith, Richard M., Jr. R.M.Hi.
 Hightower, Nicholas Carr. N.C.H.
 Higonnet, Patrice Louis-René. P.Hi.
 Hill, Dorothy. D.Hi.
 Hill, Jane H. Ja.Hi.
 Hill, J.E. Christopher. J.E.C.H.
 Hill, John Hugh. J.H.Hi.
 Hill, Laurita L. L.L.H.
 Hill, Richard Leslie. R.L.Hi.
 Hill, Roland John. R.J.Hi.
 Hiller, Lejaren. L.Hi.
 Hilton, Peter John. P.J.H.
 Hingley, Ronald Francis. R.F.Hi.
 Hintikka, K. Jaakko J. K.J.Hi.
 Hinton, Thomas B. T.B.H.
 Hiorthøy, Finn. F.Hi.
 Hirai, Naofusa. N.H.
 Hitchins, Keith Arnold. K.A.H.
 Ho, Robert. R.H.
 Hobbs, F.D. F.D.H.
 Hobson, Richard Hamilton. Ri.H.
 Hodge, Paul W. P.W.H.
 Hodges, James A. J.A.Ho.
 Hodgkin, Thomas. T.Ho.
 Hoetink, Harmannus. H.Ho.
 Hofer, Kenneth E., Jr. K.E.H.
 Hoffman, Paul F. P.F.H.
 Hoffmann, Herbert. H.Hn.
 Hoffmann, James Edward. J.E.Ho.
 Hogetsu, Keigo. K.Ho.
 Hogg, Ian Vernon. I.V.H.
 Hogg, William Richey. W.R.H.
 Hogg-Priestly, Helen Sawyer. H.S.H.-P.
 Hohl, Reinhold D. Re.H.
 Holderbaum, James. J.Hm.
 Hollister, C. Warren. C.W.Ho.
 Holm, Donald August. D.A.H.
 Holmes, John H. J.H.H.
 Holmes, Ralph. Ra.Ho.
 Holsoe, Svend E. S.E.H.
 Holstein, William K. W.K.H.
 Holt, Edgar Crawshaw. E.C.H.
 Holt, J.C. J.C.H.
 Holt, Peter M. P.M.Ho.
 Holthusen, Hans Egon. H.E.H.
 Holton, William Coffeen. W.C.Ho.
 Holttum, Richard Eric. R.E.H.
 Holtzman, Jerome. Je.Ho.
 Holzman, Philip S. P.S.H.
 Honeycutt, Baxter D. B.D.H.
 Honigmann, John J. J.J.Ho.
 Honko, Lauri O. L.O.H.
 Hood, M. Sinclair F. M.S.F.H.
 Hood, Roger. Ro.H.
 Hoogstraten, Jan S.F. van. J.v.H.
 Hoover, Herbert T. H.T.H.
 Hoover, John Edgar. J.E.Hr.
 Hopwood, Derek. D.H.
 Hornberger, Theodore. T.Hor.
 Hornblower, Simon. S.H.
 Horst, Oscar H. O.H.H.
 Hoskin, Michael Anthony. M.A.H.
 Hosking, Geoffrey Alan. G.A.H.
 Hospers, John. Jo.Ho.
 Hough, Graham Goulder. G.G.H.
 Houghton, Lois Chapman. L.C.H.
 Hourani, Albert Habib. A.H.Ho.
 House, Michael R. M.R.H.
 Houtgast, Jakob. J.H.
 Houtte, Baron Jean M.J. van. J.M.J.v.H.
 Houwink ten Cate, Philo H.J. Ph.H.J.H.t.C.
 Howard, Ian P. I.P.H.
 Howard, John Lawrence. J.L.H.
 Howard, Sir Michael E. M.E.Ho.
 Howard, Perry H. P.H.H.
 Howarth, Thomas. Th.Ho.
 Howarth, William Driver. W.D.H.
 Howe, G. Melvyn. G.M.H.
 Howell, F. Clark. F.C.H.
 Howell, Sarah McCanless. S.McC.H.
 Hoy, Cyrus Henry. C.H.Ho.
 Hoy-Petersen, Nils. N.H.-P.
 Hoyt, Joseph Bixby. J.B.Ho.
 Hrbeek, Ivan. I.Hr.
 Hsiao, Kung-chuan. K.-c.H.
 Hsieh, Chiao-Min. C.-M.H.
 Hsieh, Shan-yüan. S.-y.H.
 Hsu, Cho-yun. C.-y.H.
 Htin Aung, Maung. M.H.Au.
 Hu, Charles Y. C.Hu.
 Hu, Yueh-Gin Gung. Y.-G.G.H.
 Hubatsch, Walther C. W.C.H.
 Hubbard, William B. W.B.H.
 Hübscher, Arthur. Ar.Hü.
 Hucker, Charles O. C.O.Hu.
 Hudnut, Joseph. J.Hud.
 Hudson, Winthrop S. W.S.H.
 Huffman, John W. J.W.Hu.
 Hughes, The Rev. G.E. G.E.H.
 Hughes, Graham McK. G.McK.H.
 Hughes, Capt. Wayne P., Jr. W.P.H.
 Huizing, Peter J. P.Hu.
 Huke, Robert E. R.E.Hu.
 Hultkrantz, Åke Gunnar Birger. Å.G.B.H.
 Humphrey, John H. J.H.Hy.
 Hung, Frederick Fu. F.Hu.
 Hunt, Sir David Wathen Stather. D.W.S.H.
 Hunt, Earl B. E.B.H.
 Hunt, Inez Whitaker. I.W.H.
 Huot, Jean-Louis. J.-L.Hu.
 Huq, Muhammad Shamsul. M.S.H.
 Hurst, G. Cameron, III. G.C.H.III.
 Hurst, George Samuel. G.S.Hu.
 Hurst, Harold Edwin. H.E.Ht.
 Husain, Mahmud. M.Hu.
 Husain, Syed Sajjad. S.S.H.
 Hussey, Dyneley. D.Hus.
 Hussey, Joan Mervyn. J.M.H.
 Hussman, Lawrence C. L.E.Hu.
 Hustrulid, William Andrew. W.A.Hu.
 Hutter, Heribert R. H.R.H.
 Huxley, Herbert Henry. H.H.Hu.
 Huygens, Gerard Willem. G.W.H.
 Huyghe, René. R.Hu.
 Hyatt, J. Philip. J.P.Hy.
 Hyman, Isabelle. I.Hy.
 Iaboni, John F. J.F.I.
 Ichiko, Teiji. T.Io.
 Ichiye, Takashi. T.Ic.
 Ihde, Aaron J. A.J.I.
 IJsewijn, Jozef A.M.K. J.A.M.K.I.
 Ike, Nobutaka. N.I.
 Ikram, S.M. S.M.I.
 Imperato, Pascal James. P.J.I.
 Imshenetsky, Aleksandr Ilyich. A.I.I.
 Inalcik, Halil. H.I.
 Ingersoll, Andrew P. A.P.I.
 Ingham, Kenneth. K.In.
 Ingold, Tim. T.In.
 Ingrams, William Harold. W.H.I.
 Insall, Donald W. D.W.I.
 Introvigne, Massimo. M.I.
 Ipfling, Heinz-Jürgen. H.-J.I.
 Irmscher, Hans Dietrich. H.D.I.
 Irvine, Verity Elizabeth. V.E.I.
 Irwin, David. D.I.
 Isely, Duane. D.Is.
 Isnard, Hildebert. H.Is.
 Issawi, Charles. C.I.
 Itzkowitz, Norman. N.It.
 Ivanov, Vyacheslav Vsevolodovich. V.V.I.
 Iversen, Kristen. K.I.
 Ivić, Pavle. P.I.
 Iwasawa, Kenkichi. K.Iw.
 İz, Fahir. F.I.
 Izard, Carroll E. C.E.I.
 Izenour, George C. G.C.I.
 Izutsu, Toshihiko. T.I.
 Jackson, Christopher Stewart. C.S.J.
 Jackson, Gordon. G.J.
 Jackson, Joy Juanita. J.J.J.
 Jackson, Richard T. R.T.J.
 Jackson, Roland John. R.J.J.
 Jackson, William D. W.D.J.
 Jacob, Stanley W. S.W.J.
 Jacobs, Jeffrey W. J.W.J.
 Jacobs, Wilbur R. W.R.J.
 Jacobsen, Thorkild. T.J.
 Jacobson, Bernard. B.Ja.
 Jacoby, Oswald. O.J.
 Jaffe, Bernard. Be.J.
 Jaffé, Hans L.C. H.L.C.J.
 Jahns, Richard H. R.H.J.
 Jairazbhoy, Nazir Ali. N.A.J.
 James, A. Walter. A.W.J.
 James, C.L.R. C.L.R.J.
 James, D. Clayton. D.C.J.
 James, The Rev. Edwin Oliver. E.O.J.
 James, John W. J.W.Ja.
 James, Preston E. P.E.J.
 James, Thomas Garnet Henry. T.G.H.J.
 Jamieson, Neil L. N.L.J.
 Janda, Kenneth F. K.F.J.
 Janick, Jules. J.J.
 Jansen, Marius B. M.B.J.
 Janson, H.W. H.W.J.
 Janzen, Jörg H.A. J.H.A.J.
 Jarry, Madeleine. M.J.
 Järvinen, E. Jaakko. E.J.J.
 Jasiewicz, Krzysztof. K.Ja.
 Jasonoff, Jay H. J.H.Ja.
 Jay, Martin Evan. M.E.J.
 Jeandet, Yvette. Y.J.
 Jeanloz, Raymond. R.J.
 Jeans, D.N. D.N.J.
 Jeffares, Alexander Norman. A.N.J.
 Jellett, John Holmes. J.H.J.

- Jen, Joseph J. Jo.J.J.
 Jenkins, J. Philip. J.P.J.
 Jenkins, The Rev. Daniel T. D.T.J.
 Jenks, C. Wilfred. C.W.J.
 Jenkyns, Richard H.A. R.H.A.J.
 Jenness, Valerie. V.J.
 Jensen, Gary. Ga.J.
 Jerphagnon, Lucien. L.J.
 Jescheck, Hans-Heinrich. H.-H.J.
 Jessop, Thomas Edmund. T.E.Je.
 Johansson, Ivar K. I.J.
 Johnson, D. Gale. D.G.J.
 Johnson, Dorothy M. D.M.J.
 Johnson, Gary Dean. G.D.J.
 Johnson, John J. J.J.Jo.
 Johnson, Markes E. M.E.Jo.
 Johnson, Norman Gardner. N.G.J.
 Johnson, W. Hilton. W.H.J.
 Johnston, S. Paul. S.P.J.
 Jollie, Malcolm T. M.T.J.
 Jolly, Karen L. K.L.J.
 Jolly, William Lee. W.L.J.
 Jolowicz, Herbert Felix. H.F.J.
 Jones, Abeodu Bowen. A.B.J.
 Jones, Arnold Hugh Martin. A.H.M.J.
 Jones, Benjamin A., Jr. B.A.J.
 Jones, Douglas Henry. D.H.J.
 Jones, Emrys. E.J.
 Jones, Gareth H. G.H.J.
 Jones, J. Knox, Jr. J.K.J.
 Jones, Marsden. Ma.J.
 Jones, S.S.D. S.S.D.J.
 Jones, Thomas. T.Jo.
 Jones, Walton Glynn. W.G.J.
 Jongkees, Adriaan G. A.G.J.
 Jonsson, Ingrid Margareta. I.M.J.
 Jordan, David Starr. D.S.J.
 Jordan, Karl H.E. K.J.
 Jordan, Pascual. P.W.J.
 Josephson, Matthew. M.Jo.
 Joshi, Susan Heyner. S.H.J.
 Jovanis, Paul P. P.P.J.
 Joy, Bernard. B.Jo.
 Joy, David C. Da.C.J.
 Joynt, Robert. R.Jo.
 Joys, Charles. C.Jo.
 Juday, Glenn Patrick. G.P.J.
 Jwaideh, Wadie. W.Jw.
- Kadner, Robert J. R.J.K.
 Kadzamira, Zimani David. Z.D.K.
 Kaegi, Walter Emil, Jr. W.E.K.
 Kaeppler, Adrienne L. A.Ka.
 Kagan, Jerome. J.K.
 Kahn, Robert E. R.E.Ka.
 Kallen, Horace M. H.M.K.
 Kalman, Rudolf E. R.E.K.
 Kaltenmark, Max. Ma.K.
 Kalven, Harry, Jr. H.Ka.
 Kanayev, Viktor Filipovich. V.F.K.
 Kanda, Nobuo. N.Ka.
 Kang, Yu-chin. Y.-c.K.
 Kapelrud, Arvid S. A.S.K.
 Kaplan, Lawrence. L.K.
 Kaplan, Marion. M.Kap.
 Kaplansky, Irving. I.K.
 Karan, Pradyumna P. P.P.K.
 Karger, Barry L. B.L.K.
 Karin, Sidney. S.Ka.
 Karlen, Delmar. D.K.
 Karlsson, Gunnar. Gu.K.
 Karnes, Thomas L. T.L.K.
 Kashy, Edwin. E.Ka.
 Katritzky, Alan Roy. A.R.K.
 Kauffman, George B. G.B.Ka.
- Kaufman, Hyman. Hy.K.
 Kaufman, Terrence. Te.K.
 Kaufmann, Edgar, Jr. E.K.
 Kay, John Anderson. J.A.Ka.
 Kazantzis, George. G.Ka.
 Kazimour, Jan. Ja.K.
 Keating, Frank E. F.E.K.
 Keating, Richard C. R.C.Ke.
 Kedourie, Elie. E.Ke.
 Keen, Benjamin. B.K.
 Keenan, Edward Louis. E.L.K.
 Keene, Donald. D.Ke.
 Keep, John L.H. J.L.H.K.
 Keesing, Felix M. F.M.Kg.
 Keesing, Roger M. R.M.Ke.
 Keeton, William T. W.T.Ke.
 Kehr, Dave. Da.Ke.
 Keightley, David N. D.N.K.
 Keith, E. Gordon. E.G.K.
 Keith, G. Stuart. G.S.Ke.
 Keizer, Joel E. J.E.K.
 Keller, Mark. M.Ke.
 Keller, Roy A. Ro.A.K.
 Kellermann, Kenneth I. K.I.K.
 Kelley, Fenton Crosland. F.C.Ke.
 Kelley, Michael C. M.C.K.
 Kelling, George L. G.L.Ke.
 Kellner, Charlotte L. C.L.K.
 Kellner, Peter Jon. P.J.K.
 Kelly, The Rev. John N.D. J.N.D.K.
 Kelly-Gadol, Joan. J.K.-G.
 Kelman, Arthur. Ar.Kn.
 Kemp, The Rev. John Arthur. J.A.Ke.
 Kemp, Martin J. M.J.Ke.
 Kemp, Peter. P.Ke.
 Kendall, Paul Murray. P.M.K.
 Kendler, Howard H. H.H.K.
 Kendrick, John W. J.W.K.
 Kennard, Annajane. A.Ke.
 Kennedy, Gavin. G.Ke.
 Kennedy, Hugh. H.Ke.
 Kennedy, Michael. M.K.
 Kenney, Edward John. E.J.Ke.
 Kent, George C., Jr. G.C.K.
 Kent, Raymond K. R.K.K.
 Kent-Jones, Douglas W. D.W.K.-J.
 Kenyon, Cecelia M. C.M.K.
 Kenyon, John P. J.P.K.
 Kenyon, Dame Kathleen Mary. K.M.K.
 Kerförd, George Briscoe. G.B.K.
 Kerman, Joseph. Jo.K.
 Kerney, James, Jr. J.Ke.
 Kerr, Malcolm H. M.H.K.
 Kesby, John D. J.D.K.
 Kesel, Richard H. R.H.K.
 Kessler, Herbert Leon. H.L.Ke.
 Keyes, Charles F. C.F.Ke.
 Keyes, E. Jane. E.J.K.
 Keynes, Sir Geoffrey Langdon. G.L.K.
 Keys, Thomas Edward. T.E.K.
 Khadduri, Majid. M.Kh.
 Khalaf, Samir G. S.G.K.
 Khalidi, Tarif. T.Kh.
 Khalidi, Walid Ahmed. W.A.K.
 Khan, Zafar Ahmad. Z.A.K.
 Kieft, C. van de. C.v.d.K.
 Kiesinger, Carol D. C.D.K.
 Kiger, Joseph C. J.C.Ki.
 Killheffer, John V. J.V.K.
 Killian, Lewis M. L.M.K.
 Kim, Won-Yong. W.-Y.K.
 Kimble, George H.T. G.H.T.K.
 Kimble, Gregory A. G.A.K.
 King, Cuchlaine Audrey Muriel. C.A.M.K.
 King, Donald. D.Kg.
 King, Lester S. L.S.K.
- King, Peter K. P.K.K.
 King, Russell L. R.L.K.
 Kingsford, Michael John. M.J.Ki.
 Kingsford, Peter W. P.W.K.
 Kingslake, Rudolf. R.K.
 Kinsbruner, Jay. J.Ki.
 Kiralfy, Albert Roland. A.R.Ki.
 Kirby, F.E. F.E.Ki.
 Kirby, George Hall. G.H.K.
 Kirk, Geoffrey S. G.S.K.
 Kirk, William. W.Ki.
 Kirk-Greene, Anthony Hamilton Millard. A.H.M.K.-G.
 Kirkpatrick, Ralph. R.Ki.
 Kishlansky, Mark A. M.A.K.
 Kiste, Robert C. R.C.Ki.
 Kitagawa, Joseph M. J.M.K.
 Kitajima Masamoto. K.Ma.
 Kitson, Michael William Lely. M.W.L.K.
 Kittleson, Roger A. R.A.Ki.
 Kitto, H.D.F. H.D.F.K.
 Kiuchi, Shinzo. S.K.
 Kiwanuka, M. Semakula M. M.S.Ki.
 Kloossen, Curtis D. C.D.Ki.
 Klaniczay, Tibor. T.Ki.
 Klein, Cornelis. C.K.
 Klein, David R. D.R.K.
 Klein, Martin J. M.J.K.
 Kleinsorge, Paul Lincoln. P.L.Ki.
 Klindt-Jensen, Ole. O.K.-J.
 Kliphardt, Raymond A. R.A.K.
 Klock, B.L. B.L.Ki.
 Klocke, Robert A., M.D. R.A.Ki.
 Klopsteg, Paul E. P.E.K.
 Klots, Alexander B. A.B.K.
 Kluger, Ronald H. R.H.Ki.
 Knapp, Gregory W. Gr.W.K.
 Knapp, Wilfrid F. W.F.Kn.
 Knechtel, Herbert B. H.B.K.
 Knepper, George W. G.W.Kn.
 Knight, Arthur. A.Kn.
 Knight, David Marcus. D.M.K.
 Knight, Franklin W. F.W.Kn.
 Knight, George Angus Fulton. G.A.F.K.
 Knights, Melanie F. M.F.K.
 Knoll, Glenn F. G.F.K.
 Knorr, Wilbur R. W.R.K.
 Knowles, The Rev. Michael David. M.D.K.
 Knox, Sir T. Malcolm. T.M.K.
 Koch, Carl Fred. C.F.K.
 Kochan, Lionel. L.Ko.
 Kochan, Thomas A. T.A.K.
 Kodama, Hideomi. Hi.K.
 Koegler, Horst. H.Ko.
 Koenigsberger, Helmut Georg. H.G.K.
 Koenker, Diane P. D.P.K.
 Koeper, H.F. H.F.K.
 Koestler, Arthur. A.Ko.
 Kohl, Margaret. Ma.Ko.
 Köhler, Oswin R.A. O.R.A.K.
 Kohn, Hans. H.K.
 Kokole, Omari H. O.H.K.
 Kolb, Frank P. F.P.K.
 Kolinski, Mieczyslaw. M.Ko.
 Kondracki, Jerzy A. J.A.K.
 Kondratiev, Victor Nikolaevich. V.N.K.
 König, The Most Rev. Franz Cardinal. F.K.
 Kööri, Arno Artur. A.A.K.
 Kopp, Otto C. O.C.K.
 Korab, Harry Edward. H.E.K.
 Korkala, Pekka Yrjö. P.Y.K.
 Kornberg, Sir Hans. Ha.Ko.
 Kosarev, Aleksey Nilovich. A.N.K.
 Koshland, Daniel E., Jr. D.E.K.

- Kotler, Philip. P.Ko.
 Kracke, E.A., Jr. E.A.K.
 Krader, Lawrence. L.Kr.
 Kramrisch, Stella. S.Kh.
 Krantz, John.C., Jr. J.C.K.
 Kranzberg, Melvin. M.Kr.
 Krishna, Kumar. K.K.
 Kristinsson, Valdimar. Va.K.
 Krogh, Thomas Edvard. T.E.Kr.
 Kröner, Alfred. A.K.
 Kroner, Richard. R.Kr.
 Krueger, Anne O. A.O.K.
 Krueger, John Richard. J.R.Kr.
 Krueger, Ralph R. R.R.K.
 Kruger, Daniel Wilhelmus. D.W.K.
 Krystal, Arthur. A.Kr.
 Kryzhanivsky, Stepan
 Andriyovich. S.A.Kr.
 Krzyzanowski, Jerzy R. J.R.K.
 Krzyzanowski, Julian. J.Kr.
 Kubik, Gerhard. G.K.
 Kudo, Albert M. A.M.K.
 Kühner, Hans. H.Kü.
 Kukich, Diane S. D.S.K.
 Kumar, Krishan. Kr.K.
 Kunzle, David M. D.M.Ke.
 Kuo, Ping-chia. P.-c.K.
 Kuper, Adam. A.Ku.
 Kurath, Gertrude Prokosch. G.P.K.
 Kurtz, Harold. Ha.K.
 Kus, James S. J.S.K.
 Kuspit, Donald. D.Ku.
 Kuwata, Tadachika. T.Ku.
 Kuzin, Pavel Sergeyevich. P.S.K.
 Kyrou, Ado. A.Ky.
- Lacouture, Jean. J.La.
 Ladefoged, Peter N. P.N.L.
 Ladner, Gerhart B. G.B.L.
 Laessoe, Jorgen. Jo.La.
 Laffargue, Gen. Charles-André. C.-A.La.
 LaFond, Eugene C. E.C.LaF.
 Lafont, Pierre-Bernard. P.-B.L.
 Lagowski, J.J. J.J.L.
 Laitinen, Kai L.K. K.L.K.L.
 Lamb, Hubert Horace. H.H.L.
 Lamb, Norman Jones. N.J.L.
 Lambek, Joachim. J.L.
 Lambert, Véronique. V.L.
 Lamberts, Emiel L. E.L.L.
 Lamott, Kenneth. K.La.
 LaMourie, Matthew J. M.J.LaM.
 Lampard, Eric Edwin. E.E.La.
 Landau, Jacob M. J.M.L.
 Landgrebe, Ludwig M. L.M.L.
 Landis, Fred. Fr.L.
 Landon, H.C. Robbins. H.C.R.L.
 Lane, George S. G.S.L.
 Lane, Kenneth S. K.S.L.
 Lane, Richard. Ri.L.
 Lane, Robert K. R.K.L.
 Lang, David Marshall. D.M.La.
 Lang, George. G.L.
 Lange, Robert Terence. R.T.La.
 Langevin, Luce-André. L.-A.L.
 Lanhers, Yvonne. Y.L.
 Laoust, Henri. H.L.
 Laracy, Hugh Michael. H.M.La.
 Larnier, John. Jo.L.
 Laroui, Abdallah. A.La.
 Larson, Susan R. S.R.L.
 Laskey, Ronald A. R.A.La.
 Lasko, Peter Erik. P.E.L.
 Lassen, Erik. Er.L.
 Lasserre, François. F.La.
- Last, Geoffrey Charles. G.C.L.
 Latham, Agnes M.C. A.M.C.L.
 Latham, Earl. Ea.L.
 Latham, Richard C. R.C.L.
 Latil, Pierre de. P. de L.
 Lattimer, John Kingsley. J.K.La.
 Lattimore, Owen. O.La.
 Lattin, Harriet Pratt. H.P.La.
 Lätüketu, The Rev. Sione. Si.L.
 Latz, Gil. G.La.
 Laue, Gilbert P. G.P.L.
 Laughlin, William S. W.S.L.
 Lauwerys, Joseph Albert. J.A.L.
 Laver, James. Ja.L.
 Lavrencic, Karl. Ka.La.
 Lavrin, Janko. Ja.La.
 Law, Robin. R.La.
 Lawler, Nancy Ellen. N.E.L.
 Lawler, Sylvia Dorothy. S.La.
 Lawrence, Joseph Collins. J.C.L.
 Lawson, Robert Frederic. R.F.L.
 Lay, Maxwell Gordon. M.G.L.
 Laya, Diouldé. Di.L.
 Laybourn-Parry, Johanna E.M. J.E.M.L-P.
 Lea, Kathleen Marguerite. K.M.L.
 Lebel, Robert. R.Le.
 Lecco, Alberto. A.L.
 Lechêne, Robert. Ro.L.
 Lee, Chan. C.Le.
 Lee, Ki-baik. K.-b.L.
 Lee, Kwang-rin. K.-r.L.
 Lee, Peter H. P.H.L.
 Lee, Robert Warden. R.W.L.
 Leech, Clifford. Cl.L.
 Leeming, Frank Andrew. F.A.L.
 Legge, Dominica. D.Le.
 Legge, John David. J.D.L.
 Leggett, Anthony James. A.J.L.
 Legum, Colin. Co.L.
 Legum, Margaret Jean. M.J.L.
 Lehman, Mildred K. M.K.L.
 Lehman, Milton. M.Ln.
 Lehmann, Andrew George. A.G.L.
 Lehmann-Haupt, Hellmut E. H.E.L.-H.
 Lehnert, James S. J.S.L.
 Leicester, Henry M. H.M.L.
 Leichter, Otto. O.L.
 Leighton, Richard M. R.M.Le.
 Leiman, Sid Z. S.Z.L.
 Leinbach, Thomas R. T.R.L.
 Leite, Aureliano. A.Le.
 Leiter, Samuel. S.Lr.
 Lejeune, Michel. M.Le.
 Lekachman, Robert. R.L.
 Lemarchand, René. Re.L.
 Lenti, Libero. Li.L.
 Lentz, Thomas L. T.L.L.
 Leonard, Justin W. J.W.L.
 Leone, Lucile P. L.P.Le.
 Leontiev, Oleg Konstantinovich. O.K.L.
 Leprohon, Pierre. P.Le.
 Lerner, Richard M. Ri.M.L.
 Lernet-Holenia, Alexander Marie
 Norbert. A.L.-Ho.
 Lessing, Lawrence P. L.P.L.
 Leung, Chi-Keung. C.-K.L.
 Le Vay, David. D. Le V.
 LeVeque, William Judson. W.J.LeV.
 Levi, Albert William. A.W.L.
 Levi, Herbert W. H.W.L.
 Levi, Lorna R. L.R.L.
 Levi, Michael. Mi.L.
 Levine, Solomon B. S.B.L.
 Levinson, Sandra H. S.H.L.
 Levron, Jacques. J.Le.
 Lew, Young Ick. Y.I.L.
- Lewis, David L. D.L.Le.
 Lewis, David Malcolm. D.M.L.
 Lewis, Geoffrey D. G.D.L.
 Lewis, George Knowlton. G.K.L.
 Lewis, Hywel David. H.D.L.
 Lewis, Ioan M. I.M.L.
 Lewis, John Wilson. J.W.Le.
 Lewis, Peirce F. P.F.L.
 Leyser, K.J. K.J.L.
 Li, Fang Kuei. F.K.L.
 Li, Tien-yi. T.-y.L.
 Libin, Laurence Elliot. La.L.
 Lieberich, Heinz. H.Li.
 Lieberthal, Kenneth G. K.G.L.
 Lién, Chan. C.Li.
 Lieuwen, Edwin. E.Li.
 Lightbown, Ronald W. R.W.Li.
 Liley, Bruce Sween. B.S.L.
 Lin, Maung Wai. M.W.L.
 Lindars, Barnabas. B.L.
 Lindauer, Martin. M.Li.
 Lindbeck, Assar. A.Li.
 Lindbeck, George Arthur. G.A.L.
 Lindberg, Carter H. C.H.Li.
 Lindsay, R. Bruce. R.B.L.
 Lindt, Gillian. G.Li.
 Link, Arthur S. A.S.L.
 Linton, Michael I.A. M.I.A.L.
 Lippold, Adolf. A.Lip.
 Lisitsin, Aleksandr Petrovich. A.P.L.
 Lissens, René Felix. R.F.Li.
 Little, Donald P. D.P.L.
 Liu, Henry. He.L.
 Liu, James T.C. J.T.C.L.
 Livermore, Harold V. H.V.L.
 Llewellyn, Karl Nickerson. K.N.L.
 Lloyd, Seton H.F. S.H.F.L.
 Lloyd-Jones, David Mathias. D.M.L.-J.
 Lloyd-Jones, Hugh. H.L.-J.
 Lo, Jung-pang. J.-p.L.
 Lockard, Craig A. C.A.Lo.
 Lockhart, James. J.Lo.
 Lockhart, Richard T. R.T.L.
 Lockley, R.M. R.M.L.
 Lockspeiser, Edward. E.L.
 Lodish, Harvey F. H.F.L.
 Lodrick, Deryck O. D.O.L.
 Loeffler, M. John. M.J.Lo.
 Loewe, Fritz P. F.P.L.
 Loewy, Arthur D. A.D.L.
 Logan, Alan. A.Lo.
 Logan, Richard F. R.F.Lo.
 Logan, Robert G. R.G.Lo.
 Logsdon, John M. J.M.Lo.
 Lombardo, Antonino. An.Lo.
 Long, Charles H. C.H.Lo.
 Longford, Elizabeth Pakenham, Countess
 of. E.Lo.
 Longworth, Philip. P.L.
 Lonsdale, Dame Kathleen. K.Lo.
 Loosli, John K. J.K.L.
 Lopez, Donald S. D.S.L.
 Lopez, Robert Sabatino. R.S.L.
 Lord, M.G. M.G.Lo.
 Lorge, Barry Steven. B.S.Lo.
 Lorig, Clarence H. C.H.L.
 Losey, George S. G.S.Lo.
 Louwe Kooymans, Leendert P. L.P.L.K.
 Lovell, John Christopher. J.C.Lo.
 Lovett, Clara M. C.M.Lo.
 Low, D. Anthony. D.A.Lo.
 Low, David Morrice. D.M.Lo.
 Lowe, Victor. V.Lo.
 Lowenthal, Constance. C.Lo.
 Lucas, Donald William. D.W.L.
 Luck, Georg Hans. G.Lu.

- Lukacs, John. J.Lu.
 Lüling, Karl Heinz. K.H.L.
 Lumiansky, R.M. R.M.Lu.
 Luntz, Myron. M.Lu.
 Luscombe, David Edward. D.E.L.
 Lustig, Lawrence K. L.K.L.
 Luteyn, James L. J.L.L.
 Lutfi al-Sayyid Marsot, Afaf. A.L.al-S.M.
 Luyendyk, Bruce Peter. B.P.L.
 Lyman, John. J.Ly.
 Lynch, Cecelia M. C.M.L.
 Lynch, John. Jo.Ly.
 Lyne, A. Gordon. A.G.Ly.
 Lyons, Sir John. J.Lyo.
- Mabbott, Thomas Ollive. T.O.M.
 Mabee, Carleton. C.Ma.
 Mabin, Alan S. A.S.Ma.
 Mabogunje, Akinlawon Ladipo. A.L.M.
 Macartney, Carlile Aylmer. C.A.M.
 McAuley, Mary. M.MaCa.
 McBride, George
 McCutchen. G.McC.McB.
 McCallum, W. Cheyne. W.C.McC.
 Mac Cana, Proinsias. P.Mac C.
 McCarthy, Patrick. P.McC.
 McCarthy, Willard J. W.J.McC.
 McCaskie, T.C. T.C.McC.
 McCaskill, Murray. Mu.McC.
 McCauley, Martin. Ma.McC.
 Macchia, Giovanni. Gi.M.
 McClelland, Charles A. C.A.McC.
 McClelland, Ivy Lillian. I.L.McC.
 MacConaill, Michael A. M.A.MacC.
 McCullough, R.L. R.L.McC.
 McCully, Marilyn. M.McCu.
 McDavid, Raven I., Jr. R.McD.
 McDivitt, James F. J.F.McD.
 McDonald, Alexander Hugh. A.H.McD.
 Macdonald, Barrie K. B.K.M.
 MacDonald, Charles B. C.B.MacD.
 McDonald, Forrest. F.McD.
 McDonald, Robert A.J. R.A.J.McD.
 McDonough, Sheila D. S.McD.
 McDougall, Walter A. W.A.McD.
 MacDuffee, C.C. C.C.MacD.
 Maceda, José. Jé.Ma.
 McElroy, Michael B. M.B.McE.
 McEwen, The Rev. James
 Stevenson. J.S.McE.
 McFarlane, James Walter. J.W.McF.
 MacGaffey, Janet. J.MacG.
 MacGaffey, Wyatt. W.MacG.
 McGann, Thomas F. T.F.McG.
 McGeough, Joseph A. J.A.McG.
 McGillem, Clare D. C.D.McG.
 McGinn, Bernard J. B.J.McG.
 McGrayne, Sharon. S.McG.
 McGreevey, William Paul. W.P.McG.
 McGregor, Samuel Emmett. S.E.McG.
 Machlis, Joseph. J.Ma.
 McHugh, Christine. C.McH.
 McIntosh, Christopher Angus. C.A.McI.
 MacIsaac, Lt. Col. David. D.MacI.
 Mackenzie, Fred T. F.T.M.
 McKenzie, The Rev. John L. J.L.McK.
 Mackie, J. Alan. J.A.Ma.
 Mackintosh, Nicholas John. N.J.M.
 McKnight, Brian E. B.E.McK.
 Mackrell, Judith R. J.R.Ma.
 Mackridge, Peter A. P.A.M.
 Mack Smith, Denis. De.M.S.
 McLaughlin, John. J.McL.
 McLellan, David T. D.T.McL.
 McLellan, Mark R. M.R.McL.
- Macleod, Iseabail C. I.C.M.
 MacLeod, Murdo J. M.J.MacL.
 McLeod, Thomas S. T.S.McL.
 McLeod, William Hewat. W.H.McL.
 McLintock, Peter. P.McL.
 McLure, Charles E., Jr. C.E.McL.
 McMahon, William B. W.B.McM.
 McMaster, David N. D.N.McM.
 MacMullen, Ramsay. R.MacM.
 McMullen, Roy Donald. R.McMu.
 McMurtrey, James Edward, Jr. J.E.McM.
 McNeill, William H. W.H.McN.
 MacNutt, W. Stewart. W.S.MacNu.
 Macomber, Richard W. R.W.Ma.
 McPherron, Robert L. R.L.M.
 McQuarrie, Donald A. D.A.McQ.
 McQuillan, Lawrence J. L.J.McQ.
 MacRae, Donald Gunn. D.G.MacR.
 Madan, T.N. T.N.M.
 Madden, Thomas F. T.F.M.
 Maeno, Naoki. Na.Mo.
 Magda, Matthew S. M.S.Ma.
 Magdoff, Harry. Ha.Ma.
 Magnus, Bernd. Be.M.
 Maguire, Joseph A. Jo.A.M.
 Mahan, Gerald D. G.D.Ma.
 Mahdi, Muhsin S. M.S.M.
 Maiorana, Virginia C. V.C.M.
 Makdisi, George. G.M.
 Maksoud, Clovis F. C.F.M.
 Malandra, William W. W.W.M.
 Malcolm, Noel R. N.R.M.
 Malcolm, Norman A. N.A.M.
 Malia, Martin E. M.E.Ma.
 Malik, Liliya Konstantinovna. L.K.M.
 Malin, Michael C. M.C.Ma.
 Malina, Frank J. F.J.Ma.
 Mallett, Michael Edward. Mi.Ma.
 Mallory, V. Standish. V.S.M.
 Mallowan, Sir Max. M.Mn.
 Malm, William P. W.P.M.
 Manchester, William. W.Man.
 Manger, Walter L. W.L.Ma.
 Mann, Golo. G.Ma.
 Mann, Kenneth H. K.H.M.
 Mannheim, Hermann. H.M.
 Mannheim, L. Andrew. L.A.Ma.
 Manschreck, Clyde L. C.L.Ma.
 Manton, Sidnie M. S.M.M.
 Manuel, Frank Edward. F.E.M.
 Manvell, Roger. R.M.
 Maor, Eli. El.M.
 Maraini, Foscò. F.M.
 Marcelli, Umberto. U.M.
 March, Benjamin. B.Ma.
 March, Jerry. J.Mh.
 Marc'hadour, The Rev.
 Germain P. G.P.Ma.
 Marchand, Leslie A. L.A.M.
 Marchant, Roger Eric. R.E.M.
 Marcus, Harold G. H.G.M.
 Marcus, Leonard M. L.M.M.
 Marcuse, Sibly. S.Ma.
 Mariani, Valerio. V.M.
 Marino, John A. J.A.M.
 Markakis, John. Jo.Ms.
 Markesinis, Basil S. B.S.M.
 Markowitz, William. W.Ma.
 Marks, Robert W. R.W.M.
 Marks, Sally. Sa.M.
 Marks, Shula E. Sh.M.
 Marlowe, John. Jo.Ma.
 Marquard, Leopold. L.Ma.
 Marr, Phebe A. P.A.Ma.
 Marrou, Henri-Irénée. H.-I.M.
 Marsh, Christopher Marriage. C.M.
- Marsh, Michael. M.Ma.
 Marshall, Joe T. J.T.M.
 Marshall, John S. J.S.Ma.
 Marshall, P.J. P.J.M.
 Marshall, Robert L. Ro.Ma.
 Marshall, Woodville K. W.K.M.
 Marston, Richard A. R.A.Ma.
 Martin, Boyd A. B.A.M.
 Martin, David Grier, Jr. D.G.M.
 Martin, Gene E. G.E.Ma.
 Martin, Samuel E. S.E.M.
 Martindale, Andrew Henry Robert. A.Ma.
 Martinich, A.P. A.P.Ma.
 Martinot, Roger. R.Ma.
 Martins, Luciano. L.Ms.
 Marts, Marion E. M.E.Ms.
 Marty, Martin E. M.E.M.
 Martz, John D. J.D.Ma.
 Masai, Yasuo. Y.M.
 Mascarenhas, Adolfo C. A.C.M.
 Mason, Sir Basil John. B.J.M.
 Mason, Brian H. B.H.M.
 Mason, Edward A. E.A.M.
 Mason, Haydn T. H.T.M.
 Mason, J. Alden. J.A.Mn.
 Mason, Leonard E. L.E.M.
 Mason, Philip. P.Ma.
 Mason, Thomas O. T.O.Ma.
 Masevitch, Alla Genrikhovna. A.G.Ma.
 Massey, Alan Gibbs. A.G.M.
 Masson, John Richard. Jo.R.M.
 Masutani Fumio. Ma.Fu.
 Materné, Jan Maria Juul. J.M.J.M.
 Mathew, The Most Rev. David. D.Ma.
 Mathews, Thomas G. T.G.Ms.
 Mathis, John S. J.S.M.
 Mathur, Raj B. R.B.M.
 Matloff, Maurice. Ma.M.
 Matsumoto, Nobuhiro. N.M.
 Matthews, Bernard Edward. B.E.Ma.
 Matthews, Geoffrey Vernon
 Townsend. G.V.T.M.
 Matthews, J.F. J.F.Ma.
 Matthews, Peter B.C. P.B.C.M.
 Matthias, Erich. E.Ma.
 Matthiasson, Björn. B.M.
 Matull, Wilhelm. Wi.M.
 Matz, Samuel A. S.A.M.
 Maurer, The Rev. Armand. A.A.Ma.
 Maurer, D.W. D.W.M.
 Maxwell, D.E.S. D.E.S.M.
 May, Comdr. William Edward. W.E.M.
 Mayeda, Sengaku. Se.M.
 Mayer, Harold M. H.M.M.
 Mayer, William Vernon. W.V.M.
 Mayne, Richard J. R.J.Ma.
 Maziulis, Vytautas J. V.J.M.
 Mazur, B.W. B.W.Ma.
 Meade, Robert Douthat. R.D.M.
 Meadow, S. Roy. S.R.M.
 Medina, José Ramón. J.R.Me.
 Mee, John F. J.F.Me.
 Meerhaeghe, M.A. van. M.A.v.M.
 Meeuse, Bastiaan J.D. B.J.D.M.
 Meggs, Philip B. P.B.M.
 Mehren, Arthur Taylor von. A.T.v.M.
 Mehretu, Assefa. A.Me.
 Mei, Yi Pao. Y.P.M.
 Meier, Mark F. M.F.M.
 Meiggs, Russell. Ru.M.
 Meijer, Henk. H.Me.
 Meland, Bernard E. B.E.M.
 Mellanby, Kenneth. K.Me.
 Melsen, Andrew G.M. van. A.G.M.v.M.
 Melton, J. Gordon J.G.M.
 Meltzer, Allan H. A.H.M.

- Meltzer, Julian Louis. J.L.Me.
 Ménager, Daniel. D.Mé.
 Mendenhall, George Emery. G.E.Me.
 Mendoza, Eric. E.M.
 Mensching, Gustav. G.Me.
 Menzies, Robert James. R.J.Me.
 Merkelbach, Reinhold. R.Me.
 Merlan, Philip. Pp.M.
 Merle, Robert. Ro.M.
 Mero, John Lawrence. J.L.M.
 Merrifield, William Richard. W.R.M.
 Merrills, John G. J.G.Me.
 Mertz, Barbara G. B.G.M.
 Mertz, Pierre. P.Me.
 Mesa-Lago, Carmel. C.M.-L.
 Meselson, Matthew. Ma.Me.
 Meškauskas, Kazimieras. Ka.M.
 Metford, John Callan James. J.C.J.M.
 Meyendorff, The Rev. John. J.M.
 Meyer, Adolphe Erich. A.E.M.
 Meyer, John Richard. J.R.M.
 Meyer, Michael C. M.C.M.
 Mezei, Kathy. K.M.
 Michael, Franz H. F.H.M.
 Michel, Michel. M.Mi.
 Michelena, Luis. L.M.
 Micheltmore, Peter. P.Mi.
 Mickel, John T. J.T.Mi.
 Micklin, Philip P. P.P.M.
 Middleton, Dorothy. D.Mi.
 Middleton, Gerard V. G.V.M.
 Middleton, John F.M. J.F.M.
 Middleton, Robin David. R.D.Mi.
 Mikesell, Marvin W. M.W.M.
 Mikhaylov, Nikolay Ivanovich. N.I.M.
 Mikoletzky, Hanns Leo. H.L.M.
 Miller, John E. J.E.M.
 Miller, Joseph C. J.C.M.
 Miller, Mark D.H. M.D.H.M.
 Miller, Maynard M. M.M.M.
 Miller, William H. W.H.M.
 Millett, Allan R. A.R.Mi.
 Millgate, Michael. Mi.M.
 Millikin, Sandra. S.Mi.
 Millington, Andrew C. A.C.Mi.
 Millner, Maurice Alfred. M.A.M.
 Millon, Henry A. H.A.M.
 Millot, Jacques. Ja.M.
 Mills, Gladstone E.M. G.E.M.M.
 Miner, Ellis D. E.D.M.
 Mingst, Karen A. K.A.Mi.
 Minifie, Bernard W. B.W.M.
 Minio-Paluello, Lorenzo. L.M.-P.
 Minkel, C.W. C.W.M.
 Minogue, Kenneth R. K.Mi.
 Mints, Aleksey Aleksandrovich. A.A.M.
 Mirsky, Jeannette. J.Mir.
 Misiunas, Romuald J. R.J.Mi.
 Misner, Gordon E. G.E.Mi.
 Mitchell, Adrian C.W. A.C.W.M.
 Mitchell, G.A.G. G.A.G.M.
 Mitchell, James Clyde. J.C.Mi.
 Mitchell, Jean Brown. J.B.Mi.
 Mitchell, John. Jo.M.
 Mitchell, John Burnett. Jo.B.M.
 Mitchell, Mairin. M.Mi.
 Mitchell, Terence Croft. T.C.M.
 Mitford, Nancy. Na.M.
 Mitry, Jean. Je.M.
 Mitsch, William J. W.J.Mi.
 Mitzman, Arthur. Ar.M.
 Mizener, Arthur. A.Mi.
 Moeller, Therald. T.Mo.
 Mohanty, Jitendra N. J.N.M.
 Mokray, William George. W.G.M.
 Mokyr, Joel. Jo.Mo.
 Moldenhauer, Hans. Ha.M.
 Mollat, Michel J. M.J.Mo.
 Molnar, Peter H. P.H.M.
 Moltmann, Jürgen D. J.D.M.
 Momigliano, Arnaldo Dante. A.D.Mo.
 Momo, Hiroyuki. Hi.Mo.
 Momsen, Janet D. J.D.Mo.
 Momsen, Richard P., Jr. R.P.Mo.
 Moncada R., J. Roberto. J.R.M.R.
 Monet, The Rev. Jacques. J.Mo.
 Money, Nic J. N.J.Mo.
 Mongrédien, Georges. G.Mn.
 Monnerville, Gaston. G.Mo.
 Monroy, Alberto. A.Mo.
 Montagna, William. W.M.
 Moog, Robert A. R.A.M.
 Mookerjee, Sitanshu. S.Mo.
 Moon, Chung-in. C.-i.M.
 Moore, Gerald. Ge.Mo.
 Moore, Harold E., Jr. H.E.M.
 Moore, John Preston. J.P.M.
 Moore, Will G. W.G.Mo.
 Moraes, Frank R. F.R.M.
 Morales-Carrión, Arturo. A.M.-C.
 Moran, Francis. F.Mo.
 Moran, Warren. W.Mo.
 Morens, David D.Mo.
 Morgan, Joseph R. J.R.Mo.
 Morgan, Neil. N.Mo.
 Morgan, Stephen William
 Kenneth. S.W.K.M.
 Morgan, William Thomas
 Wilson. W.T.W.M.
 Morley, Cyril John. C.J.Mo.
 Morley, Ronald James. R.J.M.
 Morrey, Charles B., Jr. C.B.My.
 Morris, Charles Nicholas. C.N.M.
 Morris, Donald R. D.R.M.
 Morrison, Hugh Sinclair. Hu.M.
 Morrissey, Charles Thomas. C.T.Mo.
 Morrow, Jr., Robert K. R.K.Mo.
 Morsey, Rudolf. R.Mo.
 Morson, Gary Saul. G.S.M.
 Mortensen, Brita Maud Ellen. B.Mo.
 Morton, Brian. Br.M.
 Morton, Richard Lee. R.L.Mo.
 Morton, William Lewis. W.L.M.
 Moses, Larry William. L.W.M.
 Mosher, Frederick C. F.C.M.
 Mosley, J. Philip. J.P.Mo.
 Mosley, Leonard. Le.M.
 Mosse, W.E. W.E.Mo.
 Mostofi, Khosrow. Kh.Mo.
 Mostow, George Daniel. G.D.M.
 Motteler, Lee S. L.S.M.
 Moulton, Matthew James. Ma.J.M.
 Moulton, William G. Wi.G.M.
 Moumouni, Abdou. A.M.
 Movius, Hallam L., Jr. H.L.Ms.
 Mozumder, Asokendu. A.Moz.
 Mukerji, S.N. S.N.M.
 Müller, Claudius Cornelius. C.C.M.
 Müller, Joachim. J.Mu.
 Muller, Robert A. R.A.Mu.
 Müller-Freienfels, Wolfram. W.M.-F.
 Multhauf, Robert P. R.P.M.
 Munck, Ronaldo. R.Mu.
 Munn-Rankin, J.M. J.M.M.-R.
 Munro, Thomas. Th.M.
 Munroe, John A. J.A.Mu.
 Munson, J. Ronald. J.R.Mn.
 Munsterberg, Hugo. H.Mu.
 Munz, Peter. P.Mu.
 Muranov, Aleksandr Pavlovich. A.P.M.
 Murphy, Alexander B. A.B.M.
 Murphy, Arthur D. A.D.M.
 Murphy, The Rev. Francis Xavier. F.X.M.
 Murphy, James J. J.J.M.
 Murra, John V. J.V.M.
 Murray, Anne Wood. A.W.M.
 Murray, Francis J. F.J.M.
 Murray, Peter J. P.J.Mu.
 Murrell, Kathleen Berton. K.B.M.
 Murton, Ronald K. R.K.M.
 Muskie, Edmund S. E.S.M.
 Mutter, Reginald P.C. R.P.C.M.
 Mutton, Alice F.A. A.F.A.M.
 Myers, Alexander Reginald. A.R.M.
 Myers, Rollo H. R.My.
 Myint, Hla. H.My.
 Nachtergaele, Victor. V.N.
 Nadeau, Maurice. M.Na.
 Nadler, Josef. J.N.
 Naess, Arne D. A.D.N.
 Nagahara, Keiji. K.N.
 Nagel, Heinrich. H.N.
 Nagler, Alois M. A.M.N.
 Naim, C.M. C.M.N.
 Nair, Kusum. K.Na.
 Naisbitt, John. Jo.N.
 Naka, Arata. A.Na.
 Nakosteen, Mehdi K. M.K.N.
 Namias, Jerome. J.Na.
 Nanda, B.R. B.R.N.
 Nangeroni, Giuseppe. G.Na.
 Napier, J.R. J.R.N.
 Narasimhan, Chakravarthi V. C.V.N.
 Narasimhan, Raghavan. R.Na.
 Narayana, H.S. H.S.N.
 Narr, Karl J. K.J.N.
 Nash, Manning. Ma.N.
 Nash, Paul. Pa.N.
 Nash, Ray. Ra.N.
 Nasr, Seyyed Hossein. S.H.N.
 Nassau, Kurt. Ku.N.
 Nathan, Peter W. P.W.N.
 Nathanson, Jerry A. J.A.N.
 Nel, Andries. A.Ne.
 Nelson, Bert. B.Ne.
 Nelson, David M. D.M.Ne.
 Nelson, E. Clifford. E.C.N.
 Nelson, Gareth Jon. G.J.N.
 Nelson, R.J. R.J.Ne.
 Nelson, Robert J. R.J.N.
 Nemerov, Howard. H.Ne.
 Nestyev, Israel Vladimirovich. I.V.N.
 Netti, Bruno. B.N.
 Neumark, Fritz. F.N.
 Neutze, Max. M.N.
 Nevins, Allan. Al.N.
 Newhall, Beaumont. Be.N.
 Newlin, Dika. D.N.
 Newman, William Anderson. W.A.N.
 Newman, William S. W.S.N.
 Newsom-Davis, John M. J.M.N.-D.
 Newton, Brian E. B.E.N.
 Newton, Douglas. D.Ne.
 Neyman, Viktor Grigoryevich. V.G.N.
 Nicholas, Herbert G. H.G.N.
 Nicholas, Ralph W. R.W.N.
 Nicholas, Warwick L. W.L.N.
 Nichols, Robert Brayton. R.B.Ni.
 Nicholson, Norman Cornthwaite. N.C.N.
 Nicholson, Norman L. N.L.N.
 Nicol, Davidson S.H.W. D.S.H.W.N.
 Nicol, Donald MacGillivray. D.M.N.
 Nicolai, Henri. He.Ni.
 Nicolle, Jacques-M.-R. J.-M.-R.N.
 Niddrie, David Lawrence. D.L.N.
 Nielsen, Kai E. K.E.N.

- Nienhauser, William H., Jr. W.H.N.
 Nietschmann, Bernard. B.Ni.
 Nijim, Basheer K. B.K.N.
 Nijinsky, Romola. R.Ni.
 Nikiforov, Leonid Alekseyevich. L.A.N.
 Niklaus, Robert. Ro.N.
 Nisbet, Robert A. R.A.N.
 Niven, Alastair N.R. A.N.R.N.
 Niven, Ivan. I.N.
 Noback, Charles R. C.R.N.
 Noble, Allen G. A.G.N.
 Noble, Clyde Everett. C.E.N.
 Noble, J. Jeremy. J.J.No.
 Noble, William A. W.A.No.
 Noll, A. Michael. A.Mi.No.
 Noller, Carl R. C.R.No.
 Norbeck, Edward. E.N.
 Nordhagen, Per Jonas. P.J.N.
 Nordtvedt, Kenneth L., Jr. K.L.N.
 Norman, Lennart T. L.T.N.
 Norman, Sir Richard O.C. R.O.C.N.
 Norrell, Robert J. R.J.No.
 Norris, David O. D.O.N.
 Norris, Kenneth Stafford. K.S.N.
 Norris, Robert S. R.S.N.
 Norstog, Knut J. K.J.No.
 North, Robert C. R.C.N.
 Norwich, John Julius Cooper, 2nd Viscount. N.
 Notehelfer, Fred G. F.G.N.
 Nove, Alexander. A.No.
 Novick, Alvin. A.N.
 Nowell, Charles E. C.E.No.
 Nutting, Jack. J.Nu.
 Nutton, Vivian. V.Nu.
- Oakley, Francis Christopher. F.C.O.
 O'Beirne Ranelagh, John. J.O'B.R.
 Oberg, Kalervo. K.Ob.
 O'Brien, Conor Cruise. C.C.O'B.
 O'Callaghan, Joseph F. J.F.O'C.
 Occhialino, Mario E. Ma.E.O.
 Ochsenwald, William L. W.L.O.
 O'Connell, Daniel Patrick. D.P.O'C.
 O'Connor, Daniel William. D.W.O'C.
 O'Connor, Francis Valentine. F.V.O'C.
 Odlozilik, Otakar. O.O.
 Odom, Jerome David. J.D.O.
 Oehser, Paul H. P.H.O.
 Ogden, John C. J.C.O.
 Ogé, Frédéric. F.O.
 Ogilvie, Robert Maxwell. R.M.Og.
 Ogorkiewicz, Richard Marian. R.M.O.
 O'Gorman, James Francis. J.F.O'G.
 O'Grady, Brendan Anthony. B.O'G.
 O'Kelly, Bernard. B.O'K.
 Olah, George A. G.A.O.
 Oldcorn, Anthony. A.O.
 Oldenbourg-Idalie, Zoé. Z.O.
 Oldroyd, Harold. H.O.
 Oliveira, Waldir Freitas. W.F.O.
 Oliver, Michael Francis. M.F.O.
 Oliver, Paul P.O.
 Oliver, William Hosking. W.H.O.
 Olivier, Daria. D.Oi.
 Olivier, Gerrit. G.Oi.
 Olson, David R. D.R.O.
 Olson, Edwin A. E.A.O.
 Olson, Everett C. E.C.O.
 Olson, Maynard V. M.V.O.
 Olver, Ron. R.O.
 Oman, Carola (Lady Lenanton). C.O.
 Omar, Farouk. F.Om.
 Ominde, Simeon Hongo. S.H.O.
 Ommanney, Francis D. F.D.O.
- O'Neill, William L. W.L.O'N.
 Ooi Jin Bee. O.J.B.
 Opello, Walter C., Jr. W.C.O.
 Oppenheimer, Jane M. J.M.O.
 O'Raiheartaigh, Tarlach. T.O'R.
 Orcibal, Jean. J.Or.
 Ordish, George. G.O.
 Orne, Martin T. M.T.O.
 Örsy, The Rev. Ladislav M. L.M.Ö.
 Ortner, Sherry B. S.B.O.
 Orville, Richard Edmonds. R.E.Or.
 Osborn, Frederick Henry. F.H.O.
 Osborn, The Rev. Ronald E. R.E.O.
 Osborne, John W. J.W.O.
 Osborne, Milton Edgeworth. M.E.O.
 Osborne, Richard Horsley. R.H.O.
 Osler, Margaret J. M.J.O.
 Ostenso, Ned Allen. N.A.O.
 Ostrom, John H. J.H.O.
 Oteiza, David. D.O.
 O'Toole, James Joseph. J.O'T.
 O'Toole, Thomas E. T.E.O'T.
 Otto, Christian F. C.F.O.
 Outler, Albert Cook. A.C.O.
 Overton, Leonard C. L.C.O.
 Owen, D.D.R. D.D.R.O.
 Owen, Peter D. P.D.O.
 Owen, Tobias Chant. T.C.O.
 Owen, Wilfred. W.O.
 Owens, The Rev. Joseph. J.O.
 Pacaut, Marcel. M.Pa.
 Padelford, Norman J. N.J.P.
 Padian, Kevin. K.P.
 Page, Edward C. E.C.P.
 Painter, George Duncan. G.D.P.
 Painter, James E. J.E.Pa.
 Pal, Indra. I.P.
 Palerm, Angel. An.Pa.
 Pallis, Christopher A. C.A.P.
 Pallucchini, Rodolfo. R.Pal.
 Palmer, Ralph Anthony. R.A.Pr.
 Pålsson, Hermann. He.P.
 Pannain, Guido. G.Pan.
 Pannell, Clifton W. C.W.P.
 Paoletti, John T. J.T.Pa.
 Papadakis, Juan. J.Pa.
 Parczewski, Wladyslaw. W.Pa.
 Park, George Kerlin. G.K.P.
 Parke, Herbert William. H.W.P.
 Parker, Alexander A. A.A.P.
 Parker, Franklin D. F.D.P.
 Parker, N. Geoffrey. N.G.P.
 Parker, Simon B. S.B.P.
 Parkes, Henry Bamford. H.B.P.
 Parkes, Kenneth C. K.C.P.
 Parkin, Charles William. C.W.Pa.
 Parkinson, Robert Lewis. R.L.P.
 Parotto, Maurizio. Ma.P.
 Parrish, Stephen Maxfield. S.M.P.
 Parrot, André. A.Pa.
 Parry, John Horace. J.H.Py.
 Parry, V.J. V.J.P.
 Parsons, James J. Ja.J.P.
 Parsons, Neil. Ne.P.
 Pascal, Roy. Ro.Pa.
 Pashuto, Vladimir T. V.T.P.
 Passavant, Günter. G.Pa.
 Pastor, José M.F. J.M.F.P.
 Patel, C. Kumar N. C.K.N.P.
 Pathak, Devavrat Nanubhai. D.N.P.
 Patrick, Hugh T. H.T.P.
 Patterson, Colin. C.P.
 Patterson, Stephen E. S.E.P.
 Patterson, Thomas C. T.C.P.
 Pattullo, Polly. P.Pa.
 Patze, Hans. H.Pa.
- Pauck, Wilhelm. W.P.
 Paul, Robert A. Rob.A.P.
 Pauling, Linus C. L.C.P.
 Pawson, David Leo. D.L.P.
 Payanzo, Ntsomo. N.Pa.
 Payne, Stanley G. S.G.P.
 Peale, Stanton J. S.J.P.
 Pearson, Charles G. C.G.P.
 Pearson, H.F. H.F.P.
 Pedanou, Macaire K. M.K.P.
 Peel, Edwin A. E.A.P.
 Peel, Ronald Francis. R.F.Pe.
 Peiris, Gerald Hubert. G.H.P.
 Peiser, H. Steffen. H.S.P.
 Pelczar, Michael J., Jr. M.J.P.
 Pelczar, Rita M. R.M.P.
 Pelikan, Jaroslav Jan. J.J.Pe.
 Pélissier, René. R.P.
 Pélissier, Roger. Ro.Pe.
 Pen, Jan. J.P.
 Penčev, Peter Georgiev. P.G.P.
 Pendle, George. G.Pe.
 Penner, Hans H. Ha.P.
 Pennington, D.H. D.H.P.
 Penny, Nicholas B. N.B.P.
 Penrose, Mary M. M.M.P.
 Penvenne, Jeanne Marie. J.M.Pe.
 Pepelasis, Adamantios A. A.A.Ps.
 Perdue, Samuel S. S.S.P.
 Perelman, Chaim. C.Pe.
 Perham, Dame Margery. M.Pm.
 Perkins, Edward S. E.S.P.
 Pernoud, Régine. R.Pe.
 Perowne, Stewart Henry. S.H.P.
 Perrin, Norman. N.P.
 Perrott, Roy. Ro.P.
 Perry Robinson, J.P. J.P.P.R.
 Pessen, Edward. E.Pe.
 Péter, László. L.P.
 Peterdi, Gabor F. G.F.P.
 Peters, James A. J.A.P.
 Peterson, J.E. J.E.P.
 Peterson, Richard F. R.F.P.
 Petit, Paul. P.P.
 Petri, Herbert L. H.L.P.
 Petrov, Mikhail Platonovich. M.P.Pe.
 Petrov, Victor P. V.P.P.
 Petterson, Donald Rahl. D.R.P.
 Pettitt, George A. G.A.P.
 Péwé, Troy L. T.L.Pe.
 Peyre, Henri M. H.M.P.
 Pfaffmann, Carl. C.Pf.
 Phelps Brown, Ernest Henry. E.H.P.B.
 Philby, Harry St. John Bridger. H.St.J.B.P.
 Phillips, Courtenay Stanley Goss. G.S.G.P.
 Phillips, Melba. M.Ph.
 Phiri, Kings Mbazwa G. K.M.G.P.
 Pick, Robert. R.Pi.
 Pickering, Sir George. G.Pi.
 Pickersgill, John Whitney. Jo.W.P.
 Pickles, Dorothy M. D.M.P.
 Picton, John. J.Pi.
 Pielke, Roger Alvin. R.A.Pi.
 Pieper, Josef. Jf.Pi.
 Pierce, Francis S. F.S.P.
 Piercey, W. Douglas. W.D.P.
 Pietka, Mark Jeffrey. M.J.Pi.
 Pigott, George M. G.M.P.
 Pike, Dag. D.Pi.
 Pike, Roscoe A. Ro.A.P.
 Pilikian, Hovhanness Israel. Ho.I.P.
 Pinder-Wilson, Ralph H. R.H.P.-W.
 Pine, Leslie Gilbert. L.G.P.
 Pines, Shlomo. S.Pi.
 Pingree, David E. D.E.P.
 Pinka, Patricia Garland. P.G.Pi.

- Pinker, Robert A. R.A.P.
 Pipes, Richard E. R.E.Pi.
 Pippard, Sir A. Brian. A.B.P.
 Pirsig, Maynard E. M.E.P.
 Pisupati, Sarma V.L.N. S.V.L.N.P.
 Pittioni, Richard. Ri.P.
 Piveteau, Jean. J.Piv.
 Plamenatz, John P. J.P.Pl.
 Platnauer, Maurice. M.Pl.
 Playfair, Giles William. G.W.P.
 Pleština, Dijana. D.Pl.
 Pluckhahn, J. Bruce. J.B.P.
 Plumb, Sir John. Jo.Pl.
 Pocock, Tom. T.Po.
 Podany, Jerry C. J.Po.
 Podhajsky, Alois Wilhelm. A.W.P.
 Podlecki, Anthony J. A.J.P.
 Poelhekke, Jan J. J.J.P.
 Pogue, Forrest C. F.C.P.
 Pohl, Frederik. F.Po.
 Pole, J.R. J.R.Po.
 Poliakov, Michael B. M.B.P.
 Poling, Bruce E. B.E.P.
 Polis, Gary A. G.A.Po.
 Polk, William Roe. W.R.P.
 Pollack, Peter J. P.J.P.
 Pollard, John Graham. J.G.P.
 Pollard, John Richard Thornhill. J.R.T.P.
 Polmar, Norman C. N.C.P.
 Polomé, Edgar Charles. E.C.Po.
 Pomeau, René Henry. R.H.Po.
 Ponikvar, Adolph L. A.L.P.
 Pontieri, Ernesto. E.Po.
 Poole, Gary William. Ga.P.
 Poole, Gray Johnson. G.J.P.
 Poole, Kenyon Edwards. K.E.P.
 Poonawala, Ismail K. I.K.P.
 Pope, Clifford Hillhouse. C.H.P.
 Pope, Phillip E. P.E.P.
 Pope-Hennessy, Sir John. J.P.-H.
 Popkin, Richard H. R.H.P.
 Popov, Igor Vladimirovich. I.V.P.
 Poppino, Rollic E. R.E.P.
 Porter, Duncan M. D.M.Po.
 Porter, William V. W.V.P.
 Posner, Rebecca. Re.P.
 Potter, Simeon. S.P.
 Potthoff, Heinrich. H.P.
 Pottle, Frederick A. F.A.P.
 Potts, Malcolm. M.P.
 Poulsen, Thomas M. T.M.P.
 Pounder, Cuthbert Coulson. C.C.P.
 Pournaras, Dimitris. D.P.
 Pourtier, Roland. Ro.Po.
 Powell, Alan W. A.W.Po.
 Powell, James M. J.M.Po.
 Powell, Joseph Michael. Jo.M.P.
 Powell, Raphael. R.Po.
 Poznansky, Aleksander. A.P.
 Pozo Vélez, Homero. H.P.V.
 Prager, Stewart C. S.C.P.
 Prakasa Rao, Vaddiparti Lova
 Surya. V.L.S.P.R.
 Prausnitz, John M. J.M.P.
 Prawer, Joshua. Jo.Pr.
 Preece, Warren E. W.E.P.
 Preidel, Helmut. H.Pr.
 Prescott, John R.V. J.R.V.P.
 Preston, J. J.Pn.
 Prestwich, Michael Charles. M.C.P.
 Preuschen, Gerhardt. G.P.
 Prevost, Jean. J.Pr.
 Price, Arnold H. A.H.P.
 Price, Cecil John Layton. C.J.L.P.
 Price, Edward W. E.W.P.
 Prifti, Peter R. P.R.P.
 Pringle, John Douglas. J.D.Pr.
 Pringle, Robert W. R.W.P.
 Proctor, Charles Lafayette, II. C.L.P.II.
 Proskouriakoff, Tatiana. T.P.
 Proud, Lieut. Col. Richard Riseley. R.R.Pr.
 Prout, W.G. W.G.Pr.
 Prown, Jules David. J.D.Pro.
 Pruchnicki, Jerzy. Je.P.
 Pryse-Phillips, William E.M. W.E.M.P.-P.
 Puhvel, Jaan. J.Pl.
 Pulgar-Vidal, Javier. J.P.-V.
 Pulleyblank, Edwin G. E.G.P.
 Purdy, The Rev. William Arthur. W.A.P.
 Puri, Baij Nath. B.N.P.
 Purrington, Philip F. P.F.P.
 Pye, E. Michael. M.Py.
 Quate, Calvin F. C.F.Q.
 Quimby, Robert S. R.S.Q.
 Quinn, John Francis. J.F.Q.
 Quinones, Ricardo J. R.J.Q.
 Quintana, Ricardo. R.Q.
 Quinton, Anthony M. Quinton,
 Baron. A.M.Q.
 Quittmeyer, Charles Loreaux. C.L.Q.
 Rabie, Hassanein Muhammad. H.Ra.
 Rabin, Chaim. Ch.R.
 Raby, Frederic James Edward. F.J.E.R.
 Rader, Benjamin. B.Ra.
 Rae, John Bell. J.B.Ra.
 Raeff, Marc. M.Ra.
 Rafferty, Milton D. M.D.R.
 Raghavan, Chakravarthi. C.Ra.
 Rahman, Fazlur. F.R.
 Raju, Saraswati. Sa.R.
 Rakel, Robert Edwin, M.D. R.E.R.
 Ralphs, Sheila. S.Ra.
 Ram, Vernon. V.R.
 Ramani, Raja Venkat. R.V.Ra.
 Ramanujan, A.K. A.K.R.
 Ramos, Victor A. V.A.R.
 Ramsay, James Arthur. J.A.R.
 Ramsey, The Rt. Rev. Ian Thomas. I.T.R.
 Rand, Austin L. Au.L.R.
 Rang, Humphrey P. H.P.R.
 Rankin, Bayard. B.R.
 Ransom, Harry Howe. H.H.R.
 Rantsman, Yelizaveta Yakovlevna. Y.Y.R.
 Rao, R.V.R. Chandrasekhara. R.V.R.C.R.
 Rashid, Sh. Abdur. S.A.R.
 Rasmussen, John O., Jr. J.O.R.
 Rasmussen, Wayne D. W.D.R.
 Ratcliff, Graham. G.Ra.
 Ravenhill, William. W.Ra.
 Rawlings, Arthur Lionel. A.L.Ra.
 Rawlinson, John Lang. J.L.Ra.
 Rawski, Evelyn S. E.S.R.
 Rawson, Philip S. P.S.R.
 Rayside, David. D.Ra.
 Rea, Kenneth Grahame. K.G.R.
 Rea, Kenneth John. K.J.R.
 Read, Allen Walker. A.W.Re.
 Read, Donald. D.Re.
 Rebelo, Luís de Sousa. L.de S.R.
 Rechnitzer, Andreas B. A.B.R.
 Reddick, DeWitt C. DeW.C.R.
 Reese, William L. W.L.Re.
 Reeves, Marjorie E. M.E.R.
 Reeves, Thomas C. T.C.R.
 Regenstein, Joe M. J.M.Re.
 Reich, Willi. W.R.
 Reichardt, Hans. H.Re.
 Reid, John Cowie. J.C.Rd.
 Reilly, John C., Jr. J.C.Re.
 Reiman, Donald H. D.H.R.
 Reindel, Kurt. Ku.R.
 Reinhard, Marcel. M.Re.
 Reish, Donald J. D.J.R.
 Reiss, Hans Siegbert. H.S.R.
 Renger, Johannes M. J.M.R.
 Renner, Susanne S. S.S.R.
 Rentz, George S. G.Re.
 Rescher, Nicholas. N.R.
 Resis, Albert. Al.Re.
 Reuter, Lutz R. L.R.Re.
 Rexroth, Kenneth. K.Re.
 Reynolds, Frank E. F.E.R.
 Reynolds, Graham. G.R.
 Reznicek, Anton A. A.A.R.
 Rheinstein, Max. M.Rh.
 Rhoads, Edward J.M. E.J.M.R.
 Rhode, Gotthold K.S. G.K.S.R.
 Rhodes, Philip. P.Rh.
 Riasanovsky, Nicholas V. N.V.R.
 Rice, James Robert. J.R.R.
 Rich, Alan. A.Ri.
 Richards, Alan W. A.W.R.
 Richards, D.S. D.S.Ri.
 Richards, Eric Stapleton. E.S.Ri.
 Richardson, Bonham C. B.C.Ri.
 Richardson, Hugh E. H.E.R.
 Richardson, John S. J.S.Ri.
 Richardson, Margaret Ann. M.A.R.
 Richardson, Robert G. R.G.R.
 Riché, Pierre. P.R.
 Richey, Michael William. M.W.Ri.
 Richmond, Rollin C. Ro.R.
 Rickard, John David. J.D.Ri.
 Rickel, A. Brewster. A.B.Ri.
 Ride, W.D.L. W.D.L.R.
 Ridolfi, Roberto. Ro.Ri.
 Riesenfeld, Stefan Albrecht. S.A.Ri.
 Rightmire, G. Philip. G.P.Ri.
 Riley, Edward C. E.C.R.
 Ring, Richard R. R.R.R.
 Ringer, Alexander L. A.L.R.
 Ringgren, Helmer. H.R.
 Ringler, William Andrew, Jr. W.A.Ri.
 Ripin, Edwin M. E.M.R.
 Ritchie, C.T. C.T.R.
 Ritter, Dale F. D.F.R.
 Ritter, Raymond. R.Ri.
 Ritterbush, Philip C. P.C.R.
 Riva, Alfredo. Al.R.
 Riva, Joseph P., Jr. J.P.Ri.
 Rivlin, Helen Anne B. H.A.B.R.
 Rizley, John H. J.H.R.
 Robb, Nesca A. N.A.R.
 Robbins, Jonathan H. J.H.Ro.
 Robbins, Sidney Martin. S.M.R.
 Robbins, Stanley L. S.L.R.
 Roberts, Andrew D. A.D.R.
 Roberts, Michael. M.Ro.
 Robertson, Kenneth R. K.R.R.
 Robins, Robert Henry. Ro.H.R.
 Robinson, Arthur. Ar.R.
 Robinson Arthur Napoleon
 Raymond. A.N.R.R.
 Robinson, Christopher. C.Ro.
 Robinson, Daniel Sommer. D.S.R.
 Robinson, David J. D.J.Ro.
 Robinson, Edgar Eugene. E.E.R.
 Robinson, Elwyn B. E.B.R.
 Robinson, Frank Neville H. F.N.H.R.
 Robinson, George Clarence. G.C.R.
 Robinson, Gloria. G.Ro.
 Robinson, J. Lewis. J.L.Ro.
 Robinson, Joan Violet. J.Ro.
 Robinson, Romney. R.R.

- Robinson, W. Andrew. W.A.Ro.
 Robison, Richard A. R.A.R.
 Robson, James Scott. J.S.Ro.
 Robson, Norman K.B. N.K.B.R.
 Robson, William Alexander. W.A.R.
 Robson, William Wallace. W.W.R.
 Rockwell, Anne F. A.F.R.
 Rodgers, H.B. H.B.Ro.
 Rodnan, Gerald P. G.P.R.
 Rodriguez, Ferdinand. F.Ro.
 Rodríguez-Monegal, Emir. E.R.-M.
 Roe, Michael. M.R.
 Roey, Jan L.R. Van. J.V.R.
 Rogers, Leonard R. L.R.R.
 Rogers, M. Elizabeth. M.E.Ro.
 Rogg, Lionel A. L.A.R.
 Rogge, Helmuth. He.R.
 Rohde, Peter P. P.P.R.
 Roider, Karl A., Jr. K.A.R.
 Rollin, Jack D. J.D.Ro.
 Rollins, Reed C. R.C.R.
 Rolt, L.T.C. L.T.C.R.
 Romas, Nicholas A. N.A.Ro.
 Romer, Alfred S. A.S.R.
 Ronan, Colin Alistair. C.A.R.
 Ronen, Dov. D.Ro.
 Roos, Hans. Ha.Ro.
 Roosa, Robert Vincent. R.V.R.
 Roper, Clyde F.E. C.F.E.R.
 Rose, Leo E. L.E.R.
 Rosemont, Franklin. Fr.R.
 Rosen, Edward. Ed.R.
 Rosenberg, Pierre M. P.M.R.
 Rosenthal, Anne L. A.Ro.
 Rosenthal, Erwin I.J. E.I.J.R.
 Roseveare, Henry Godfrey. H.G.R.
 Ross, C.D. C.D.R.
 Ross, Charles A. Ch.A.R.
 Ross, June R.P. J.R.P.R.
 Ross, Marvin Chauncey. M.C.R.
 Ross, Peter McGregor. P.McG.R.
 Ross, Sydney. S.R.
 Rossi, Mario. M.R.
 Rostovtsev, Mikhail Ivanovich. M.I.R.
 Rothschild, The Hon. Miriam
 Louisa. M.L.R.
 Rothwell, Gar W. G.W.R.
 Rothwell, Kenneth S. K.R.
 Rouch, Jean Pierre. J.P.R.
 Rouzé, Michel. Mi.Ro.
 Rowe, David C. D.C.R.
 Rowe, James Wilmot. J.W.R.
 Rowe, John A. Jo.R.
 Rowe, Margaret Ann. M.A.Ro.
 Rowe, Peter John. P.J.R.
 Rowen, Herbert H. H.Ro.
 Rowlatt, Mary. Ma.R.
 Rowlinson, John Shipley. Jo.S.R.
 Rowton, Michael B. M.B.R.
 Royde-Smith, John Graham. J.R.-S.
 Rubinstein, Nicolai. N.Ru.
 Rudge, Peter. P.Ru.
 Rudwick, Elliott. El.R.
 Rugg, Dean S. D.S.Ru.
 Ruggles, Eleanor. E.Ru.
 Ruhmer, Eberhard. Eb.R.
 Ruijgh, Cornelis Jord. C.J.R.
 Ruiter, Leendert de. L. de R.
 Rumney, George Richard. G.R.R.
 Rupp, The Rev. Ernest Gordon. E.G.R.
 Rushbrook Williams, Laurence
 Frederic. L.F.R.W.
 Rushe, George J. G.J.R.
 Russell, Charles R. C.R.R.
 Russell, Don. D.R.
 Russell, Jeffrey Burton J.B.R.
 Russell, Norman H. N.H.R.
 Russell, Sir Peter Edward. P.E.R.
 Russon, Allien R. A.R.R.
 Ryabchikov, Aleksandr
 Maximovich. A.M.R.
 Ryalls, Alan. A.R.
 Ryan, Alan. A.Ry.
 Ryan, Judith J.Ry.
 Ryan, The Rev. Edward A. E.A.R.
 Ryan, William B.F. W.B.F.R.
 Ryckmans, Jacques. J.R.
 Rycroft, David K. D.K.R.
 Ryder, John D. J.D.R.
 Rylaarsdam, J. Coert. J.C.Ry.
 Ryland, John S. J.S.R.
 Sabr, Mohy el Din. M.e.D.S.
 Sacher, George A. G.A.Sa.
 Sachs, The Rev. William L. W.L.Sa.
 Sadek, Dawlat Ahmed. D.A.Sa.
 Sadie, Stanley. S.Sa.
 Sadler, John E. J.E.Sa.
 Sáez, Emilio. E.Sa.
 Safarian, A. Edward. A.E.Sa.
 Sagan, Carl. C.Sn.
 Saggs, Henry W.F. H.W.F.S.
 Sainsbury, John C. J.C.Sa.
 St. John, Robert. R.St.J.
 Sakamoto, Taro. T.Sa.
 Sala, Marius. M.S.
 Salah, Mostafa Moh. M.M.Sa.
 Sale, William Merritt, Jr. W.M.S.
 Salibi, Kamal Suleiman. K.S.S.
 Salisbury, Sir Edward James. E.J.S.
 Salisbury, Neil E. N.E.S.
 Salita, Domingo C. D.C.S.
 Saller, Richard P. R.P.Sa.
 Salmi, Mario. M.Sal.
 Salmon, Edward Togo. E.T.S.
 Salmon, John Hearsey
 McMillan. J.H.McM.S.
 Salvini-Plawen, Luitfried von. L.v.S.-P.
 Sammons, Jeffrey L. J.L.Sa.
 Sammons, Jeffrey T. J.T.Sa.
 Sampson, F. Bruce. F.B.S.
 Samuel, Alan Edouard. A.E.S.
 Samuel, Pierre. P.S.
 Sandeen, Ernest R. E.R.S.
 Sandelin, Carl Fredrik. C.F.S.
 Sander, Emilie T. E.T.Sa.
 Sanders, Edward P. E.P.Sa.
 Sanders, William T. W.T.Sa.
 Sanderson, R. Thomas. R.T.S.
 Sandvik, Gudmund. G.Sa.
 Saner, Hans. Ha.S.
 Sanford, D. Gregory. D.G.Sa.
 Sanger, Clyde William. C.W.S.
 Sankovitch, Tilde A. T.A.Sa.
 Sansing, David G. D.G.S.
 Sarà, Michele. M.Sa.
 Sarason, Irwin G. I.G.S.
 Sarmiento, Sergio. S.S.
 Sarna, Nahum M. N.M.Sa.
 Sartori, Claudio. C.Sa.
 Sasaki, Genjun H. G.H.S.
 Sato, Tadao. T.S.
 Satter, Heinrich. H.Sa.
 Saul, Nigel E. N.E.Sa.
 Saunders, D. Gail. D.G.Ss.
 Saunders, Jason Lewis. Ja.L.S.
 Sautter, Gilles François. G.F.S.
 Savage, George. Ge.S.
 Saville, James Patrick. J.P.S.
 Savory, Roger M. R.M.Sa.
 Sawyer, Geoffrey. G.S.
 Saxon, A.H. A.H.Sa.
 Scace, Robert I. R.I.S.
 Scanlon, David G. Da.G.S.
 Scarborough, Harold. Ha.Sc.
 Scarne, John. J.S.
 Scaroni, Alan W. A.W.Sc.
 Scarpelli, Dante G. D.G.Sc.
 Schaaf, William L. W.L.S.
 Schaden, Egon. Eg.S.
 Schaeffer, Bobb. B.Sc.
 Schaeffer, Claude Frédéric
 Armand. C.F.A.S.
 Schaetzl, Randall John. R.J.Sc.
 Schafer, Thomas A. T.A.S.
 Schagrin, Morton L. M.L.Sc.
 Schaper, Eva. Ev.S.
 Schapiro, Leonard Bertram. L.B.S.
 Scharf, Aaron. A.Sc.
 Scharlemann, Robert P. R.P.S.
 Schatz-Uffenheimer, Rivka. R.S.-U.
 Schawlow, Arthur L. Ar.L.S.
 Scheer, Bradley Titus. B.T.S.
 Scheffer, Terry J. T.J.S.
 Scheina, Robert L. R.L.Sc.
 Schell, Herbert S. H.S.Sc.
 Schimmel, Annemarie. An.Sc.
 Schirmann, Jefim H. J.Sc.
 Schlechten, Albert Wilbur. A.W.S.
 Schleunes, Karl A. K.A.Sc.
 Schlieder, Gunnar. Gu.S.
 Schmale, Franz-Josef. F.-J.Se.
 Schmid, Rudolf. Ru.Sc.
 Schmidt, John D. J.D.Sc.
 Schmidt, Karl Patterson. K.P.S.
 Schmidt, R.A.M. R.Sc.
 Schmidt, Jr., Robert H. R.H.Sc.
 Schmitt, Hans Otto. H.O.Sc.
 Schneider, Ronald Milton. R.M.S.
 Schneider, Stephen H. S.H.S.
 Schofer, Joseph L. J.L.Sc.
 Schofield, Wilfred Borden. W.B.S.
 Scholes, Walter V. W.V.S.
 Schram, Stuart Reynolds. S.R.S.
 Schregle, Johannes. J.Sch.
 Schreiber, B. Charlotte. B.C.S.
 Schreyvogel, Friedrich. F.Sc.
 Schubert, Bernice Giduz. B.G.S.
 Schuller, Gunther. G.Sch.
 Schultz, Alarich R. A.R.S.
 Schulz, Wallace W. W.W.S.
 Schulz, Walter. W.Sc.
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 Schumacher, Alvin J. A.J.Sc.
 Schumm, Brooke, Jr. B.S.
 Schumm, Stanley A. S.A.S.
 Schürmann, Reiner. R.Sch.
 Schwab, Frederick L. F.L.S.
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 Schwartz, Mark F. M.F.S.
 Schwartz, Maurice L. M.L.S.
 Schwartz, Mischa. M.Sch.
 Schwartz, Paul A. P.A.S.
 Schwartz, Robert S. R.S.S.
 Schwartz, Theodore B. T.B.S.
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 Scott, Joseph Frederick. J.F.S.
 Scott, Peter. P.Sc.
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- Seale, Robert L. R.L.Se.
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 Sen, Amulya Chandra. A.Se.
 Sen, D.M. D.M.S.
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 Seroff, Victor Ilyich. V.I.S.
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 Service, Elman R. E.R.Se.
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 Severin, Giles Timothy. G.T.Se.
 Sewall, Richard B. R.B.S.
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 Shakabpa, Tsepon W.D. T.W.D.S.
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 Sharp, Robert Phillip. R.P.Sp.
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 Shaw, Byron Thomas. B.T.Sh.
 Shaw, Caroline Sarah. C.S.Sh.
 Shaw, Ivan Peter. I.P.S.
 Shaw, Malcolm N. M.N.S.
 Shaw, Stanford Jay. S.J.S.
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 Sheehan, James J. J.J.Sh.
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 Shelton, John E. J.E.S.
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 Shepperson, George Albert. G.A.S.
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 Sheriff, Robert E. R.E.Sh.
 Sherman, Franklin. F.S.
 Shewmon, Paul G. P.G.Sh.
 Shibatani, Masayoshi. M.Si.
 Shiel, James. J.Shi.
 Shih, The Rev. Joseph Hsing-san. J.H.-s.S.
 Shillinglaw, Gordon. G.Sh.
 Shiloah, Amnon. A.Sh.
 Shiloh, Ailon. An.S.
 Shimahara, Nobuo. N.S.
 Shineberg, D.L. D.L.Sh.
 Shinoda, Minoru. M.Sh.
 Shipman, Frank M. F.M.S.
 Shirendev, B. B.Sv.
 Shirley-Smith, Sir Hubert. H.S.-Sm.
 Shock, Nathan Wetherill. N.W.S.
 Shoemaker, Frank C. F.C.S.
 Shore, Arthur Frank. A.F.Sh.
 Short, Lester L. L.L.S.
 Short, Nicholas M. N.M.S.
 Shoshani, Jeheskel (Hezy). Je.Sh.
 Shrimpton, Nicholas. N.Sh.
 Shriver, D.F. D.F.S.
 Shu, Frank H. F.H.Sh.
 Shubert, Adrian. Ad.S.
 Shurtleff, Malcolm C. M.C.S.
 Shuster, Donald Raymond. D.R.Sh.
 Sibley, David C.G. D.C.G.S.
 Sicherman, Harvey. Ha.Si.
 Sick, Helmut. H.S.
 Siebens, Arthur A. A.A.S.
 Sieber, Roy. Ro.Si.
 Siegmund, David O. D.O.S.
 Sikainga, Ahmad Alawad. Ah.A.S.
 Silaev, Evgeny Dmitrievich. E.D.S.
 Silber, Kate. K.Si.
 Silberbauer, George Bertrand. G.Si.
 Silbergeld, Jerome. Je.Si.
 Silberman, Lou Hackett. L.H.S.
 Siliciano, Robert F. R.F.S.
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 Silverman, Joseph. Jo.Si.
 Silverstein, Josef. J.Si.
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 Simmons, Pauline. Pa.S.
 Simmons, William B. W.B.Si.
 Simon, Akiba Ernst. A.E.Si.
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 Simpson, Robert. R.Si.
 Simpson, Roger Henry. R.H.S.
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 Sinclair, Sir Keith. Ke.S.
 Singer, Peter. P.Si.
 Singh, H.K. Manmohan. H.K.M.S.
 Singh, Khushwant. K.S.
 Singh, R. Paul. R.P.Si.
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 Sinnhuber, Karl A. K.A.Si.
 Sinor, Denis. D.Si.
 Sircus, Wilfred. W.S.
 Sirkin, Les. L.Si.
 Sissom, Leighton E. L.E.Si.
 Sivaramamurti, Calambur. C.S.
 Sivasubramaniam, Sinnathurai. S.Si.
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 Skinner, Brian J. B.J.S.
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 Skone, John Francis. J.F.Sk.
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 Slamecka, Vladimir. V.Si.
 Slemmon, Gordon R. G.R.Si.
 Sloane, Thomas O. T.O.S.
 Slobin, Mark S. M.S.S.
 Slonimsky, Nicolas. N.Si.
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 Smale, Stephen. S.Sm.
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 Smart, Ninian. N.Sm.
 Smedley, Audrey. A.Sm.
 Smelser, Neil J. N.J.S.
 Smentkowski, Brian P. B.P.S.
 Smethurst, Colin. C.Sm.
 Smith, Brian K. B.K.S.
 Smith, Bruce Lannes. B.L.S.
 Smith, Charles Gordon. C.G.S.
 Smith, David Eugene. D.E.S.
 Smith, David Roger. D.R.S.
 Smith, Gabriel. Ga.S.
 Smith, George Alan. G.A.Sm.
 Smith, J. Beverley. J.B.Sm.
 Smith, James Irvine. J.I.S.
 Smith, Jeremy M.B. J.M.B.S.
 Smith, John Edwin. J.E.Sm.
 Smith, Jonathan Z. J.Z.S.
 Smith, Lacey Baldwin. La.B.S.
 Smith, Lyman B. L.B.Sm.
 Smith, Neal Griffith. N.G.S.
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 Smith, Phillip J. P.J.S.
 Smith, Ralph J. R.J.Sm.
 Smith, Robert C. R.C.Sm.
 Smith, Robert Leo. R.L.Sm.
 Smith, W. John. W.J.S.
 Smith-Rose, Reginald Leslie. R.L.S.-R.
 Smogorzewski, Kazimierz Maciej. K.M.S.
 Smylie, The Rev. James Hutchinson. J.H.Sm.
 Smyth, James Desmond. J.D.Sm.
 Smyth, Jim. J.Sm.
 Smyth, The Rev. Kevin. K.Sm.
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 Snellgrove, David Llewelyn. D.L.S.
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 Snyder, James E. J.E.Sn.
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 Sokoloff, Leon. L.S.
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 Solmi, Angelo. A.So.
 Solmsen, Friedrich. F.So.
 Solnit, David B. D.B.So.
 Solomon, Arthur K. A.K.S.
 Solomon, Lee H. L.H.So.
 Soltis, Andrew E. A.E.So.
 Somers, Harold M. H.M.S.
 Sonntag, Richard E. R.E.So.
 Sorabji, Cornelia K. C.K.So.
 Sørensen, Marie-Louise Stig. M.-L.S.S.
 Sorley Walker, Kathrine. K.S.W.
 Sosa, Estanislao Navarro. E.N.So.
 Soucy, Robert. Ro.So.
 Sourdel, Dominique. D.So.
 Soustelle, Jacques. Ja.S.
 Southall, Aidan William. Ai.S.
 Southam, Brian C. B.C.So.
 Southgate, Donald. Do.S.
 Sowers, Robert W. R.So.
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 Spalding, James C. J.C.S.
 Spaulding, Jay L. J.L.Sp.
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 Spear, T.G. Percival. T.G.P.S.
 Spears, Monroe K. M.K.Sp.
 Spedding, Frank Harold. F.H.S.
 Spekke, Arnold. Ar.Sp.
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 Spencer, J. Brookes. J.B.Sp.
 Spencer, John R. J.R.Sp.
 Spencer, Joseph E. Jo.E.S.
 Spencer, The Rev. Sidney. S.Sp.
 Spencer, Terence John Bew. T.Sp.
 Spencer, Ulric M. U.M.S.
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 Spinka, Matthew. M.Sp.
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 Spring, David. D.Sp.
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 Squyres, Steven W. S.W.S.
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 Staehelin, L. Andrew. L.A.St.
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 Stainton, Leslie Anne. L.St.

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 Stannard, Lewis Judson, Jr. L.J.S.
 Stant, Margaret Yvonne. M.Y.S.
 Stanzione, Kaydon Al. K.A.St.
 Stark, Wayne Eric. W.E.St.
 Starke, Helmut Dietmar. H.D.S.
 Starkey, Lawrence H. L.H.St.
 Starr, Chester G. C.G.St.
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 Stebelsky, Ihor. I.St.
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 Steere, William Campbell. W.C.St.
 Stehkämper, Hugo. H.St.
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 Stein, Wilfred D. W.D.S.
 Steinberg, Alfred. A.Sg.
 Steinberg, Ellis P. E.P.S.
 Steinberg, S. Henry. S.H.St.
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 Stendahl, The Rev. Krister. K.St.
 Stephan, Ruth. Ru.S.
 Stephens, Richard Walton. Ri.W.S.
 Stephenson, F. Richard. F.R.S.
 Stephenson, R.J. R.J.S.
 Stephenson, Ralph. R.St.
 Stern, Henri. He.S.
 Stern, Samuel Miklos. S.M.Sn.
 Sternberg, Robert J. R.J.St.
 Sternstein, Lawrence. La.S.
 Steudel, Johannes. J.Ste.
 Stevens, Denis William. D.W.S.
 Stevens, Halsey. H.Ss.
 Stevens, Malcolm P. M.P.S.
 Stevens, Sylvester K. S.K.S.
 Stevenson, Dennis William. D.W.St.
 Stevenson, Lloyd Grenfell. L.G.S.
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 Stewart, John I.M. J.I.M.S.
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 Stewart, Robert E. R.E.S.
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 Stone, Julius. Ju.S.
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 Strauss, Gerald. Ge.St.
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 Strickmann, Michel. M.St.
 Strode, Hudson. Hu.S.
 Strohl, G. Ralph. G.R.S.
 Stroll, Avrum. Av.S.
 Strugnell, John. Jo.St.
 Struik, Dirk Jan. D.J.S.
 Stuart-Smith, James. J.S.-Sm.
 Stubbs, William Edward. W.E.S.
 Stuewer, Roger H. R.H.St.
 Sturley, Kenneth Reginald. K.R.S.
 Sturmberger, Hans. H.St.
 Styau, J.L. J.L.S.
 Suárez, Jorge A. J.A.S.
 Subrahmanyam, Sanjay. S.Su.
 Subramani. S.
 Suckling, Eustace E. E.E.S.
 Suettinger, Robert Lee. R.L.Su.
 Suggs, Robert Carl. R.C.Su.
 Sukhopara, Fyodor Nikolayevich. F.N.S.
 Sullivan, Lawrence E. L.E.S.
 Sullivan, Michael. M.Su.
 Summerson, Sir John. J.Sum.
 Sumner, Margaret Ann. M.A.Su.
 Sundaram, K.V. K.V.Su.
 Sundblad, Ilmari. I.Su.
 Suny, Ronald Grigor. R.G.Su.
 Supranovich, Tatyana Yosifovna. T.Y.S.
 Suryadinata, Leo. L.Sur.
 Süsskind, Charles. Ch.S.
 Sutherland, Carol Humphrey Vivian. C.H.V.S.
 Sutherland, Sir James R. J.R.Su.
 Sutherland, N.M. N.M.Su.
 Sutton, Christine. Ch.Su.
 Sutton, Denys. D.Su.
 Sutton, Keith. K.Su.
 Sutulov, Alexander. A.Su.
 Suzuki, Chusei. C.Su.
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 Swenson, J. Patricia Morgan. J.P.M.S.
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 Sze, S.M. S.M.Sz.
 Szyliowicz, Joseph S. J.S.Sz.
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 Tait, Hugh. H.Ta.
 Takeuchi, Yoshinori. Y.T.
 Talbi, Mohamed. M.Ta.
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 Talbot Rice, Tamara. T.T.R.
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 Taruskin, Richard. Ri.Ta.
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 Tax, Sol. So.T.
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 Thorpe, William Homan. W.H.T.
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 Toyoda, Takeshi. T.T.
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 Traub, Col. Robert. R.T.
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 Treves, François. F.Tr.
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 Tricker, Ronald A.R. R.A.R.T.
 Trinkaus, Erik. E.Tr.

- Trinterud, L.J. L.J.T.
 Tripp, Maureen Heneghan. M.H.
 Truchet, Jacques. J.Tr.
 Trussell, John B.B. J.B.B.T.
 Truswell, A. Stewart. A.S.T.
 Tsegmid, Sh. Sh.Ts.
 Tsoumis, George Thomas. G.Ts.
 Tucci, Giuseppe. Gi.T.
 Tucker, David H. D.H.T.
 Tucker, Glenn. G.Tu.
 Tulchin, Joseph S. J.S.T.
 Tuma, Elias H. E.H.T.
 Tuppen, John N. J.N.T.
 Turnbull, Archie Rule. A.R.T.
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 Turner, B.L. B.L.T.
 Turner, Edward Lewis. E.L.T.
 Turner, Sir Eric Gardner. E.G.T.
 Turner, Henry Ashby, Jr. H.A.T.
 Turner, Ralph H. R.H.T.
 Turnock, David. D.T.
 Turville-Petre, E.O.G. E.O.G.T-P.
 Tu Wei-ming. T.W.-m.
 Tuttle, Russell Howard. R.H.Tu.
 Twersky, Isadore. I.T.
 Twidale, Charles Rowland. C.R.T.
 Twitchett, Denis C. D.C.T.
 Tyler, James Chase. J.C.T.

 Uda, Michitaka. M.U.
 Udo, Reuben Kenrick. R.K.U.
 Uhl, Natalie W. N.W.U.
 Uibopuu, Valev. V.U.
 Ulak, James T. J.T.U.
 Ullmann, Walter. W.U.
 Ulrich, Homer. H.U.
 Underwood, Benton J. B.J.U.
 Underwood, E. Ashworth. E.A.U.
 Underwood, Vernon Philip. V.P.U.
 Unhjem, Arne. A.U.
 Untermann, Jürgen. J.U.
 Unwin, George. G.U.
 Unwin, Philip Soundy. P.U.
 Uotila, Urho A. U.A.U.
 Upton, Arthur Canfield. A.C.U.
 Urbach, Peter Michael. P.M.U.
 Urry, William G. W.G.U.
 Usselman, Melvyn C. M.C.U.

 Vajda, Georges. G.V.
 Vale, Malcolm G.A. M.G.A.V.
 Valencia, Mark J. M.J.V.
 Valgiglio, Ernesto. E.Va.
 Vallier, Dora. D.V.
 Vanacore, Constance B. C.B.V.
 van Andel, Tjeerd H. T.H.v.A.
 Vance, James E., Jr. J.E.V.
 van Creveld, Martin. M.v.C.
 Vanderpool, Eugene. E.V.
 Van der Wee, Herman F.A. H.F.A.V.d.W.
 Van Deusen, Glyndon G. G.G.V.D.
 Van Deusen, Hobart Merritt. H.M.V.D.
 Vanger, Milton I. M.I.V.
 Van Helden, Albert. A.V.H.
 Van Horn, Kent R. K.R.V.H.
 Van Molle, Leen. L.V.M.
 Vann, Richard T. R.T.V.
 Van Steenberghen, Fernand. F.V.Sn.
 Van Valen, Leigh M. L.M.V.V.
 Varela, René Santamaria. R.S.V.
 Varshneya, Arun Kumar. A.K.V.
 Vaughan, Richard. R.Va.
 Vázquez, Josefina Zoraida. J.Z.V.
 Veevers, John J. J.J.V.

 Velásquez, M. Tulio. M.T.V.
 Veldman, Meredith. M.V.
 Venables, John D. J.D.V.
 Vendler, Zeno. Z.V.
 Venkataramanan, Lalgudi S. L.S.V.
 Vennesland, Birgit. B.V.
 Verlaan, Philomene A. P.A.V.
 Verlinden, J. Charles. J.C.V.
 Vermeule, Emily D. Townsend. E.D.T.V.
 Vernet Ginés, Juan. J.V.G.
 Verniers, Louis. L.Ve.
 Veyret, Paul. P.V.
 Viallaneix, Paul. P.Vi.
 Vidalenc, Jean. J.Vi.
 Vidyarthi, Lalita P. L.P.V.
 Viereck, Peter. Pe.V.
 Vierhaus, Rudolf. Ru.V.
 Vignaux, Paul D. P.D.V.
 Vigne, Randolph. R.V.
 Viguera, María J. M.J.Vi.
 Villee, Claude A. C.A.V.
 Villiers, Alan John. A.J.V.
 Vinacke, W. Edgar. W.E.V.
 Vinaver, Eugène. E.Vi.
 Vincent, Paul F. P.F.V.
 Vine, Brent. B.Vi.
 Vioux, Marcelle. M.Vi.
 Virtanen, Reino. R.Vi.
 Vishny, Michele. Mi.V.
 Vita-Finzi, Claudio. C.V.-F.
 Vodovozov, Sergey Arsenteyevich. S.A.V.
 Voegelin, Charles F. C.F.V.
 Voegelin, Florence M. F.M.V.
 Vogt, Hans K. H.K.V.
 Volkmann, Hans. H.V.
 Von Eckardt, Wolf. W.V.E.
 von Hagen, Victor Wolfgang. V.W.v.H.
 Voss, Gilbert L. G.L.V.
 Vowles, Jack. J.Vo.
 Joyce, Arthur. A.Vo.

 Waage, Frederick O. F.O.Wa.
 Waage, Karl M. K.M.W.
 Wachtel, Andrew B. A.B.Wa.
 Wacker, Peter O. P.O.W.
 Waddams, A.L. A.L.W.
 Waddington, Conrad H. C.H.W.
 Wade, Leroy G., Jr. L.G.W.
 Waerden, Bartel Leendert van der. B.L.v.d.W.
 Waggoner, Paul Edward. P.E.W.
 Wagner, Peggy. P.Wa.
 Wagner, Robert R. R.R.W.
 Wagner, Warren H., Jr. W.H.Wa.
 Wagnleitner, Reinhold. R.Wa.
 Wailes, Rex. R.W.
 Waines, David. D.Wa.
 Wake, David B. D.B.W.
 Wakefield, Hugh. Hu.Wa.
 Walbank, Frank W. F.W.W.
 Waldman, Marilyn R. M.R.W.
 Walford, Lionel A. L.A.Wa.
 Walker, Alan. A.W.
 Walker, Paul E. P.W.
 Walker, Robert Donald. R.D.Wa.
 Walker, Thomas W. T.W.Wa.
 Walker, Warren F., Jr. W.F.W.
 Wallace, Irving. Ir.W.
 Wallace, Willard M. W.M.Wa.
 Wallace-Hadrill, John Michael. J.M.W.-H.
 Wallenfeldt, E.C. E.C.W.
 Wallerstein, Immanuel. I.W.
 Walling, Cheves T. C.T.W.
 Wallis, Helen Margaret. H.M.W.
 Walsh, William Henry. W.H.W.

 Walton, Harold F. H.F.W.
 Wandycz, Piotr S. P.S.Wa.
 Wang, Chun Tsin. C.T.Wa.
 Wang, Hao. H.Wa.
 Wang, Yi Chu. Y.C.W.
 Wang Mingye. Wa.M.
 Wanmali, Sudhir Vyankatesh. S.V.W.
 Ward, Norman. N.W.
 Wardman, Harold W. H.W.W.
 Ware, James Hamilton, Jr. J.H.Wa.
 Warid, Warid A. W.A.W.
 Warmington, Brian H. B.H.W.
 Warner, Robert Austin. R.A.Wa.
 Warren, Andrew. A.Wa.
 Warren, James V. J.V.W.
 Warshaw, David M. D.M.W.
 Watanabe, Akira. Ak.W.
 Waterhouse, Sir Ellis K. E.K.W.
 Waterson, Duncan Bruce. D.B.Wa.
 Watkin, David John. D.J.Wa.
 Watson, Comdr. Bruce W. B.W.Wa.
 Watson, Derek. De.W.
 Watson, Sir F.J.B. F.J.B.W.
 Watson, Gray. G.Wa.
 Watson, J. Garth. J.G.W.
 Watson, James L. Jm.L.W.
 Watson, James Wreford. J.W.W.
 Watson, John Steven. J.S.W.
 Watson, Paul F. P.F.W.
 Watson, Richard A. R.A.W.
 Watson, William. W.W.
 Watt, William Montgomery. W.M.W.
 Watts, David. Da.W.
 Watts, William Walter. W.W.W.
 Waworontoe, Willem Johan. W.J.W.
 Wayne, Stephen J. S.J.W.
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 Webb, Byron H. B.H.Wa.
 Webb, Kempton E. K.E.W.
 Webb, Paul David. P.D.W.
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 Webster, Bruce. B.Wc.
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 Webster, Grady L. G.L.W.
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 Weibel, Ewald R. E.R.W.
 Weibull, Jörgen. Jo.Wc.
 Weidner, Richard Tilghman. R.T.Wc.
 Weigend, Guido Gustav. G.G.Wd.
 Weigend, Thomas. T.Wc.
 Weigmann, Hans-Dietrich H. H.D.H.W.
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 Weinbaum, Marvin G. M.G.W.
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 Weinstein, Donald. D.Wc.
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 Weintal, Edward. E.W.
 Weintraub, Stanley. S.Wc.
 Weis, Elisabeth. E.Wc.
 Weiss, Stanley I. S.I.W.
 Weitzman, Stanley H. S.H.W.
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 Wells, James M. J.M.Wa.
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 Welzel, Hans Fritz. Ha.Wc.
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 Wentz, Edward F. E.F.W.
 Wentworth-Sheilds, Francis William. F.W.W.-S.

- Werblowsky, R.J. Zwi. R.J.Z.W.
 Werkman, Evert. Ev.W.
 Wermuth, Heinz Fritz. H.F.We.
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 Werveke H. van. H. van W.
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 West, James King. J.K.W.
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 Westermann, Claus. C.W.
 Westermann, Edwin J. E.J.W.
 Westfall, Richard S. R.S.W.
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 Weston, Burns H. Bu.H.W.
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 Westrup, Sir Jack Allan. J.A.W.
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 Wheeler, Douglas Lanphier. D.L.W.
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 White, Fred N. F.N.W.
 White, Gilbert F. G.F.W.
 White, Leslie A. L.A.W.
 White, Vera Muriel. V.M.W.
 White, William B. W.B.Wh.
 Whitehead, Alfred North. A.N.W.
 Whitehead, Frederick. F.Wh.
 Whitehill, Walter Muir. W.M.Wh.
 Whitelock, Dorothy. D.W.
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 Whyte, William Foote. W.F.Wh.
 Wiarda, Howard J. H.J.Wi.
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 Wickert, Lothar F.K. L.F.K.W.
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 Wiese, Bernd Michael. B.M.W.
 Wiesenberg, E.J. E.J.Wi.
 Wiesflecker, Hermann. H.Wi.
 Wigglesworth, Sir Vincent Brian. V.B.W.
 Wilber, Donald N. D.N.W.
 Wilbur, C. Martin. C.M.Wi.
 Wilhelm, Hellmut. He.W.
 Wilken, Robert L. Ro.W.
 Wilkinson, Elizabeth M. E.M.Wn.
 Wilkinson, Lancelot Patrick. L.P.Wi.
 Willett, Frank. F.Wi.
 Willetts, William Young. W.Y.W.
 Willey, Basil. B.W.
 Willey, Gordon R. G.R.W.
 Williams, Sir Edgar Trevor. E.T.W.
 Williams, Geoffrey J. G.J.Wi.
 Williams, J.E. Caerwyn. J.E.C.W.
 Williams, Jody. J.Wi.
 Williams, John Hoyt. J.H.Wi.
 Williams, L. Pearce. L.P.W.
 Williams, Marcus K. M.K.W.
 Williams, Nelson Raymond. N.R.W.
 Williams, Robert Deryck. R.D.W.
 Williams, Thomas A. T.A.W.
 Williams, William David. W.D.W.
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 Wilson, Mitchell. M.Wi.
 Wilson, Nixon A. N.A.W.
 Wilson, Philip K. P.K.W.
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 Wina, Arthur N.L. A.N.L.W.
 Winberry, John J. J.J.W.
 Winchester, A.M. A.M.W.
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 Wingren, Gustaf. G.Win.
 Winker, Carol Ann. C.A.Wi.
 Winstedt, Sir Richard Olof. R.O.Wt.
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 Wolfson, Albert. A.Wo.
 Wolin, Richard B. R.B.W.
 Wolman, M. Gordon. M.G.Wo.
 Woloch, Isser. I.Wo.
 Wolpert, Stanley A. S.A.Wo.
 Wolpoff, Milford H. M.H.Wo.
 Wolter, The Rev. Allan Bernard. A.B.W.
 Wolters, Oliver W. O.W.W.
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 Wong, King Lit. K.L.W.
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 Woodall, Mary. M.Wo.
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 Woodward, John. J.Wo.
 Woodward, John B. J.B.W.
 Woodward, Ralph Lee, Jr. R.L.W.
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 Frederick. C.F.W.
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 Wright, Arthur F. A.F.W.
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- Wright, John Wilfrid. J.W.Wr.
 Wright, Marion I. M.I.Wr.
 Wright, Stephen Graham. S.G.W.
 Wurfel, David O.D. D.O.D.W.
 Wurm, Stephen A. S.A.W.
 Wu Shih-ch'ang. W.S.-cg.
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- Yale, David Eryl Corbet. D.E.C.Y.
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 Yefremov, Yuri Konstantinovich. Y.K.Y.
 Yerger, Ralph W. R.W.Y.
 Yerofeyev, Ivan Alekseyevich. I.A.Y.
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 Young, Ernest P. E.P.Y.
 Young, Jay A. J.A.Y.
 Young, Philip. P.Y.
 Young, Roland S. R.S.Y.
 Young, T. Cuyler, Jr. T.C.Y., Jr.
 Young, Thomas W. T.W.Y.
 Young, Warren Melvin. W.M.Yo.
 Yu, Woo-ik. W.-i.Y.
 Yudofsky, Stuart C. S.C.Y.
- Zakharova, Tatyana
 Konstantinovna. T.K.Z.
 Zallen, Richard. R.Z.
 Zangwill, Oliver Louis. O.L.Z.
 Zarenda, Harry. H.Za.
 Záruba, Quido. Q.Z.
 Zasenkov, Oleksa Eliseyovich. O.E.Z.
 Zasloff, Joseph J. J.J.Z.
 Zeeden, Ernst Walter. E.W.Z.
 Zeiller, Warren. W.Z.
 Zeisel, Hans. H.Z.
 Zelinsky, Wilbur. W.Ze.
 Zeman, Z.A.B. Z.A.B.Z.
 Zeng Zungu. Z.Z.
 Zenkovich, Vsevolod Pavlovich. V.P.Z.
 Zernov, Nicolas M. N.Z.
 Zetlin, Lev. L.Z.
 Zgusta, Ladislav. L.Zg.
 Zhdanov, Vladimir Viktorovich. V.V.Z.
 Zhmuida, Viktor Borisovich. V.B.Z.
 Zhong Gong-fu. Z.G.
 Ziadeh, Nicola Abdo. N.A.Z.
 Zimmermann, Martin Huldrych. M.H.Z.
 Zirin, Harold. H.Zi.
 Zöllner, Erich. E.Zö.
 Zoltán, Imre. I.Z.
 Zorn, Roman J. R.J.Z.
 Zuberi, Matinuzzaman. M.Zu.
 Zuccari, Frank. F.Z.
 Zucker, Moses. M.Z.
 Zudaire Huarte, E. E.Z.H.
 Zug, George R. G.R.Z.
 Zukowsky, John R. J.R.Z.
 Zumberge, James Herbert. J.H.Z.
 Zumdahl, Steven S. S.S.Z.
 Zürcher, Erik. E.Z.
 Zusi, Richard L. R.L.Z.
 Zvelebil, Kamil V. K.V.Z.
 Zygmund, Antoni. A.Zy.

Authorities for the Micropædia

volumes 1–12

Material in these volumes was written by or is based on material or advice submitted by the following authorities.

Part One. Matter and Energy

George Ogden Abell (d. 1983). *Professor of Astronomy, University of California, Los Angeles, 1967–83.*

Anatole Abragam. *Professor of Nuclear Magnetism, Collège de France, Paris, 1960–85.*

Roger Adams (d. 1971). *Professor of Organic Chemistry, University of Illinois, Urbana, 1919–57.*

Henry Gavin Alexander. *Headmaster, Hampton School, England. Editor of the Leibniz-Clarke correspondence.*

Lawrence Hugh Aller. *Emeritus Professor of Astronomy, University of California, Los Angeles.*

Douglas M.W. Anderson. *Reader in Chemistry, University of Edinburgh.*

Edward Neville da Costa Andrade (d. 1971). *Quain Professor of Physics, University of London, 1928–50.*

Isaac Asimov (d. 1992). *Science writer. Professor of Biochemistry, Boston University, 1979–92.*

Larned B. Asprey. *Staff member, Los Alamos National Laboratory, N.M., 1949–86.*

Lawrence Badash. *Professor of the History of Science, University of California, Santa Barbara.*

Donald Baim. *Freelance writer on physics.*

Robert Horace Baker (d. 1964). *Professor of Astronomy, University of Illinois, 1923–51.*

Virginia Bartow. *Associate Professor Emerita of Chemistry, University of Illinois, Urbana.*

Curt W. Beck. *Research Professor of Chemistry, Vassar College, Poughkeepsie, N.Y.*

J.M. Beckers. *Experimental Astrophysicist, European Southern Observatory, Garching, Ger.*

Jeremy Bernstein. *Professor of Physics, Stevens Institute of Technology, Hoboken, N.J.*

Robert H. Bernstein. *Research Assistant, Department of Physics, Columbia University.*

R. Byron Bird. *Vilas Research Professor of Chemical Engineering, University of Wisconsin, Madison.*

William John Bishop (d. 1961). *Editor, Medical History. Librarian, Wellcome Historical Medical Library, London, 1946–53.*

Bart Bok (d. 1983). *Professor of Astronomy, University of Arizona, Tucson, 1966–74.*

Rupert Stevenson Bradley (deceased). *Reader in Inorganic and Structural Chemistry, University of Leeds, Eng.*

John C. Brandt. *Former Chief, Laboratory for Astronomy and Solar Physics, Goddard Space Flight Center, National Aeronautics and Space Administration, Greenbelt, Md.*

J.W. Buchta (d. 1966). *Professor of Physics, University of Minnesota, Minneapolis, 1938–62.*

Anton B. Burg. *Emeritus Professor of Chemistry, University of Southern California, Los Angeles.*

Joseph A. Burns. *Professor of Mechanics and Astronomy, Cornell University, Ithaca, N.Y.*

Horace R. Byers. *Emeritus Professor of Meteorology, Texas A&M University, College Station.*

Eric Dungan Carlson. *Senior Astronomer, Adler Planetarium, Chicago.*

Michael H. Carr. *Member, Voyager and Galileo Imaging Teams, Geological Survey, U.S. Department of the Interior, Menlo Park, Calif.*

Joseph M. Chamberlain. *Director, Adler Planetarium, Chicago, 1968–91.*

James W. Christy. *Physicist, Hughes Aircraft, Tucson, Ariz.*

Francis Edward Cislak (d. 1990). *Director of Research, Reilly Tar and Chemical Corporation, Indianapolis, Ind., 1937–73.*

Norman Clarke. *Emeritus Secretary and Registrar, Institute of Mathematics and Its Applications, Southend-on-Sea, Eng.*

Paul R. Clifford. *Former Department Head, Environmental Chemistry and Biology, Metrek Division, Mitre Corporation, McLean, Va.*

Barbara Lovett Cline. *Biology teacher. Author of The Questioners: Physicists and the Quantum Theory.*

Gerhard L. Closs (d. 1992). *A.A. Michelson Distinguished Service Professor of Chemistry, University of Chicago, 1974–92.*

J.E. Coates (d. 1973). *Professor of Chemistry, University College of Swansea, University of Wales, 1920–48.*

Alexander Cowie (d. 1993). *Professor of Mechanical Engineering, Illinois Institute of Technology, Chicago; 1938–67. Associate Editor, Technology, Encyclopædia Britannica, Chicago, 1967–72.*

Frank Donald Drake. *Professor of Astronomy and Astrophysics, University of California, Santa Cruz.*

Raynor Duncombe. *Professor of Aerospace Sciences, University of Texas at Austin.*

Edward W. Dunham. *Former Research Associate, Department of Earth, Atmospheric, and Planetary Sciences, Massachusetts Institute of Technology, Cambridge.*

Richard H. Eastman. *Emeritus Professor of Chemistry, Stanford University, Calif.*

Olin Jeuck Eggen. *Senior Astronomer, Cerro Tololo Inter-American Observatory, La Serena, Chile.*

Farouk El-Baz. *Director, Center for Remote Sensing, Boston University.*

James L. Elliot. *Professor of Astronomy and Physics; Director, Wallace Astrophysical Observatory, Massachusetts Institute of Technology, Cambridge.*

Paul P. Ewald (d. 1985). *Professor of Physics, Polytechnic Institute of Brooklyn, N.Y., 1949–59.*

Henry Eyring (d. 1981). *Distinguished Professor of Chemistry and Professor of Metallurgy, University of Utah, Salt Lake City, 1967–81.*

Henry Feuer. *Emeritus Professor of Chemistry, Purdue University, West Lafayette, Ind.*

Henry Michael Foley (d. 1982). *Professor of Physics, Columbia University, 1954–82.*

Alfred B. Garrett. *Emeritus Professor of Chemistry, Ohio State University, Columbus.*

Tom Gehrels. *Professor, Lunar and Planetary Laboratory, University of Arizona, Tucson.*

Thomas R.P. Gibb, Jr. *Emeritus Professor of Chemistry, Tufts University, Medford, Mass.*

Frederick William Gibbs (d. 1966). *Deputy Secretary and Editor, Royal Institute of Chemistry, London.*

Henry Lee Giclas. *Astronomer, Lowell Observatory, Flagstaff, Ariz., 1942–81.*

Peter J. Gierasch. *Professor of Astronomy, Cornell University, Ithaca, N.Y.*

Owen Gingerich. *Professor of Astronomy and of the History of Science, Harvard University. Senior Astronomer, Smithsonian Astrophysical Observatory, Cambridge, Mass.*

James Gleick. *Science writer, The New York Times, 1986–88.*

Leo Goldberg (d. 1987). *Director, Kitt Peak National Observatory, Tucson, Ariz., 1971–77. Higgins Professor of Astronomy, Harvard University, 1960–73.*

Donald Goldsmith. *President, Interstellar Media, Berkeley, Calif.*

Murray Goodman. *Professor of Chemistry, University of California, San Diego.*

Lois Graham. *Emeritus Professor of Mechanical Engineering, Illinois Institute of Technology, Chicago.*

Frank Greenaway. *Keeper, Department of Chemistry, Science Museum, London, 1967–80.*

Edward F. Greene. *Jesse H. and Louisa D. Sharpe Metcalf Professor Emeritus of Chemistry, Brown University, Providence, R.I.*

Earle Covington Gregg (d. 1983). *Professor of Radiology, School of Medicine, Case Western Reserve University, Cleveland.*

Dirk ter Haar. *Emeritus Reader in Theoretical Physics, University of Oxford; Emeritus Fellow of Magdalen College, Oxford.*

Wayne B. Hadley. *Engineering Scientist, AMP Incorporated, Harrisburg, Pa.*

Dalziel Llewellyn Hammick (d. 1966). *Fellow of Oriol College, Oxford, 1921–52; Aldrichian Praelector in Chemistry, University of Oxford, 1949–52.*

Edward Robert Harrison. *Professor of Astrophysics, University of Massachusetts, Amherst.*

William K. Hartmann. *Senior Scientist, Planetary Science Institute, Science Applications, Inc., Tucson, Ariz.*

George N. Hatsopoulos. *President, Thermo Electron Corporation, Waltham, Mass.*

Gerald S. Hawkins. *Astronomer, Smithsonian Astrophysical Observatory, Cambridge, Mass., 1962–74.*

Eleanor Kay Helin. *Member of the technical staff, Jet Propulsion Laboratory, California Institute of Technology, Pasadena.*

Wilfried Heller (deceased). *Professor of Chemistry, Wayne State University, Detroit, 1953–73.*

James B. Hendrickson. *Professor of Chemistry, Brandeis University, Waltham, Mass.*

G.H. Herbig. *Professor of Astronomy, Lick Observatory, University of California, Santa Cruz.*

John Herivel. *Former Reader in the History and Philosophy of Science, Queen's University of Belfast, N.Ire.*

Reuben Hersh. *Professor of Mathematics, University of New Mexico, Albuquerque.*

Max H. Hey. *Senior Principal Scientific Officer, Department of Mineralogy, British Museum (Natural History), London, 1951–69.*

Christopher T. Hill. *Scientist I, Fermi National Accelerator Laboratory, Batavia, Ill.*

William B. Hubbard. *Professor of Planetary Sciences, University of Arizona, Tucson.*

Maurice Loyal Huggins. *Research consultant. Senior Research Associate, Arcadia Institute for Scientific Research, Woodside, Calif., 1968–75.*

Merkel Henry Jacobs (d. 1970). *Professor of General Physiology, University of Pennsylvania, Philadelphia, 1923–35.*

Stanley Eric Janson (d. 1974). *Keeper, Department of Astronomy and Geophysics, Science Museum, London, 1967–69; Keeper, Department of Chemistry, 1959–67.*

Hamilton Moore Jeffers (d. 1976). *Astronomer, Lick Observatory, Mount Hamilton, Calif., 1938–61.*

Flora Johnson. *Freelance writer on technical subjects.*

William J. Kaufmann (d. 1994). *Adjunct Professor of Physics, San Diego State University, Calif.*

Richard Kimmel. *Freelance writer on physics.*

George B. Kistiakowsky (d. 1982). *Abbot and James Lawrence Professor of Chemistry, Harvard University.*

Martin Jesse Klein. *Eugene Higgins Professor of Physics and the History of Science, Yale University.*

Charles T. Kowal. *Staff Scientist, Computer Sciences Corp., Space Telescope Science Institute, Baltimore, Md.*

Sonja Krause. *Professor of Physical Chemistry, Rensselaer Polytechnic Institute, Troy, N.Y.*

Polykarp Kusch (d. 1993). *Regental Professor of Physics, University of Texas at Dallas, 1980–82. Cowinner, Nobel Prize for Physics, 1955.*

Juliet Lee-Franzini. *Professor of Physics; Director, Lepton-Photon Spectrometer Group, State University of New York at Stony Brook.*

Henry M. Leicester (d. 1991). *Professor of Biochemistry, University of the Pacific, San Francisco, 1948–77.*

Dame Kathleen Lonsdale (d. 1971). *Professor of Chemistry, University of London, 1949–68.*

Raymond Arthur Lyttleton (d. 1995). *Professor of Theoretical Astronomy, University of Cambridge, 1969–78; Fellow of St. John's College, Cambridge, 1978–95.*

Douglas McKie (d. 1967). *Professor of History and Philosophy of Science, University of London, 1957–64.*

William Marshall MacNevin (deceased). *Professor and Chairman, Department of Chemistry, Ohio State University, Columbus.*

William Markowitz. *Adjunct Professor of Physics, Nova University, Fort Lauderdale, Fla., 1972–91. Astronomer, U.S. Naval Observatory, Washington, D.C., 1936–66; Director, Time Service, 1953–66.*

Ladislav L. Marton (d. 1979). *Chief, Office of International Relations, National Bureau of Standards, Washington, D.C., 1962–70; Chief, Electron Physics Section, 1948–62.*

Alla Genrikhovna Mashevitch. *Leading Scientist, Astronomical Institute, Russian Academy of Sciences, Moscow; former Vice President, Astronomical Council.*

Gary Mechler. *Astronomy consultant and writer.*

Henry Jay Melosh. *Professor of Planetary Sciences and Geosciences, University of Arizona, Tucson.*

Eric Mendoza. *Emeritus Professor of Science Teaching, Hebrew University of Jerusalem.*

Paul Willard Merrill (d. 1961). *President, American Astronomical Society. Member of staff, Mt. Wilson and Palomar Observatories, Pasadena, Calif., 1929–52.*

Allan H. Morrish. *Distinguished Professor of Physics, University of Manitoba, Winnipeg.*

Frederick C. Nachod (d. 1992). *Director of Special Projects, Sterling-Winthrop Research Institute, Rensselaer, N.Y., 1974–78; Chemical Liaison Staff Director, 1964–74.*

Gerald C. Nelson. *Member of the Technical Staff, Sandia Laboratories, Albuquerque, N.M.*

Francis Netter. *Head, Department of the Linear Accelerator, Nuclear Research Centre, Saclay, Fr.*

The Rev. Daniel J.K. O'Connell, S.J. (d. 1982). *Director of the Vatican Observatory, Castel Gandolfo, 1952–70.*

Charles Robert O'Dell. *Professor of Space Physics and Astronomy, Rice University, Houston, Texas.*

Peter Oesper. *Professor of Chemistry, St. Lawrence University, Canton, N.Y.*

Ralph Edward Oesper (d. 1977). *Professor of Analytical Chemistry, University of Cincinnati, Ohio, 1937–51.*

John A. O'Keefe. *Astronomer, Laboratory for Astronomy and Solar Physics, Goddard Space Flight Center, National Aeronautics and Space Administration, Greenbelt, Md.*

George A. Olah. *Professor of Chemistry, University of Southern California, Los Angeles. Nobel Prize for Chemistry, 1994.*

Donald E. Osterbrock. *Professor of Astronomy, Lick Observatory, University of California, Santa Cruz.*

Thornton Leigh Page. *Research Astrophysicist, Lyndon B. Johnson Space Center, National Aeronautics and Space Administration, Houston, Texas. Professor of Astronomy, Wesleyan University, Middletown, Conn., 1958-68.*

Bernard E.J. Pagel. *Deputy Chief Scientific Officer, Royal Greenwich Observatory, Herstmonceux, Eng. Visiting Professor of Astronomy, University of Sussex, Brighton, Eng.*

James Bayard Parsons (d. 1985). *Professor of Chemistry, University of Chicago, 1958-61.*

H. Steffen Peiser. *Chief, Office of International Relations, National Bureau of Standards, U.S. Department of Commerce, Washington, D.C., 1969-79.*

Melba Phillips. *Emerita Professor of Physics, University of Chicago.*

Herman Pines (d. 1996). *Vladimir Ipatieff Professor of Chemistry, Northwestern University, Evanston, Ill., 1953-70.*

Michael Polanyi, M.D. (d. 1976). *Professor of Social Studies, 1948-58; Professor of Physical Chemistry, 1933-48, Victoria University of Manchester.*

Ernest Rabinowicz. *Professor of Mechanical Engineering, Massachusetts Institute of Technology, Cambridge.*

John O. Rasmussen, Jr. *Emeritus Professor of Chemistry, University of California, Berkeley.*

Donald G. Rea. *Special Assistant to the Director, Jet Propulsion Laboratory, California Institute of Technology, Pasadena.*

Franklin Evans Roach. *Physicist, U.S. National Bureau of Standards, 1954-65.*

Frank Neville H. Robinson (d. 1996). *Senior Research Officer, Clarendon Laboratory, University of Oxford, 1962-92.*

Colin Alistair Ronan (d. 1995). *Science writer and lecturer.*

Carl (Edward) Sagan (d. 1996). *Director, Laboratory for Planetary Studies, 1968-96; David Duncan Professor of Astronomy, Cornell University, Ithaca, N.Y., 1977-96.*

Edwin Ernest Salpeter. *J.G. White Distinguished Professor of Physical Science, Cornell University, Ithaca, N.Y.*

Bernard G. Saunders. *Associate Editor, Physics, Encyclopædia Britannica, Chicago, 1970-73, Physicist, Lawrence Radiation Laboratory, University of California, Livermore, 1959-70.*

Arthur L. Schawlow. *Professor of Physics, Stanford University, Calif. Cowinner, Nobel Prize for Physics, 1981.*

Aurelia Keith Townes Schawlow (Mrs. Arthur L. Schawlow).

Hermann I(rving) Schlesinger (d. 1960). *Professor of Chemistry, University of Chicago.*

Maarten Schmidt. *Professor of Astronomy, California Institute of Technology, Pasadena.*

Robert L. Seale. *Professor of Nuclear and Energy Engineering, University of Arizona, Tucson.*

Frederick Hanley Seares (d. 1964). *Assistant Director, Mount Wilson Observatory of the Carnegie Institution of Washington, Pasadena, Calif., 1925-40.*

Emilio Gino Segrè (d. 1989). *Professor of Physics, University of California, Berkeley, 1946-72. Nobel Prize for Physics, 1959.*

Ralph Pray Seward. *Emeritus Professor of Chemistry, Pennsylvania State University, University Park.*

Charles Donald Shane (d. 1983). *Director, Lick Observatory, University of California, Santa Cruz, 1945-58.*

Steven Soter. *Senior Research Associate, Center for Radiophysics and Space Research, Cornell University, Ithaca, N.Y.*

Robert Spence (d. 1976). *Master of Keynes College; Professor of Applied Chemistry, University of Kent at Canterbury, Eng., 1968-73. Director, Atomic Energy Research Establishment, Harwell, Eng., 1964-68.*

Steven W. Squyres. *Professor of Astronomy, Cornell University, Ithaca, N.Y.*

Vernon Arthur Stenger. *Consultant, Dow Chemical Company, Midland, Mich.*

Kaj Aa. Strand. *Scientific Director, U.S. Naval Observatory, Washington, D.C., 1963-77.*

Christine Sutton. *Science writer. Research Associate, Department of Nuclear Physics, University of Oxford.*

Yervant Terzian. *Professor and Chairman, Department of Astronomy, Cornell University, Ithaca, N.Y.*

Saul Arno Teukolsky. *Professor of Physics and Astronomy, Cornell University, Ithaca, N.Y.*

Sir George Paget Thomson (d. 1975). *Professor of Physics, University of London, 1930-52. Cowinner, Nobel Prize for Physics, 1937.*

Peter van de Kamp (d. 1995). *Professor of Astronomy, Swarthmore College, Pa., 1940-72.*

Birgit Vennesland. *Head, Vennesland Research Laboratory, Max Planck Society, 1970-81; Director, Max Planck Institute for Cell Physiology, Berlin, 1968-70.*

Joseph Veverka. *Associate Professor of Astronomy, Cornell University, Ithaca, N.Y.*

Robert Vernon Wagoner, Jr. *Professor of Physics, Stanford University, Calif.*

Robert M. Wald. *Professor of Physics, University of Chicago.*

Cheves T. Walling. *Distinguished Professor Emeritus of Chemistry, University of Utah, Salt Lake City.*

Charles A. Wert. *Emeritus Professor of Metallurgy, University of Illinois at Urbana-Champaign.*

Gunther K. Wertheim. *Member, Chemical Physics Research Laboratory, AT&T Bell Laboratories, Murray Hill, N.J.*

F. Wesemael. *Research Assistant in Physics, University of Montreal.*

George Willard Wheland (d. 1972). *Professor of Chemistry, University of Chicago.*

Donald H. White. *Professor of Physics, Western Oregon State College, Monmouth.*

Gerald James Whitrow. *Emeritus Professor of the History and Applications of Mathematics, Imperial College of Science and Technology, University of London.*

Edward Wichers (d. 1984). *Associate Director, National Bureau of Standards, U.S. Department of Commerce, Washington, D.C., 1958-62; Chief, Division of Chemistry, 1948-58.*

John A. Wood, Jr. *Geologist, Smithsonian Astrophysical Observatory, Cambridge, Mass.*

Sir Richard Woolley (d. 1986). *Director, South African Astronomical Observatory, 1972-76.*

Fritz Zwicky (d. 1973). *Professor of Astrophysics, California Institute of Technology, Pasadena, 1942-68. Staff Astronomer, Mt. Wilson and Palomar Observatories.*

Part Two. The Earth

Clifford A. Barnes. *Emeritus Professor of Oceanography, University of Washington, Seattle.*

Michel J. Batisse. *President, Regional Activities Centre for the Blue Plan for the Mediterranean, UNESCO, Paris.*

Louis J. Battan (d. 1986). *Professor of Atmospheric Sciences, University of Arizona, Tucson, 1958-86.*

Werner A. Baum. *Emeritus Professor of Meteorology; Emeritus Dean, College of Arts and Sciences, Florida State University, Tallahassee.*

Kenneth O. Bennington. *Research Chemist, Thermodynamics Laboratory, Albany Metallurgy Research Center, Bureau of Mines, U.S. Department of the Interior, Albany, Ore.*

Marland P. Billings. *Emeritus Professor of Geology, Harvard University.*

F. Donald Bloss. *Alumni Distinguished Professor of Mineralogy, Virginia Polytechnic Institute and State University, Blacksburg.*

William Frank Bradley (d. 1973). *Professor of Chemical Engineering, University of Texas at Austin.*

George William Brindley (d. 1983). *Professor of Mineral Sciences, Pennsylvania State University, University Park, 1962–73.*

Max Edwin Britton. *Biological Scientist, Geological Survey, U.S. Department of the Interior, Reston, Va., 1974–80.*

Edward Morgan Brooks. *Professor of Geology and Geophysics, Boston College, Chestnut Hill, Mass., 1968–81 and 1985.*

Arthur C. Barrington Brown. *Consulting oil geologist.*

Franklin Becker Brown. *Former Director of Research and Development, Union Carbide Corporation, Chemicals and Plastics Operations Division, South Charleston, W.Va.*

Wesley Carr Calef. *Emeritus Professor of Geography, Illinois State University, Normal.*

Carleton Abramson Chapman. *Former Professor of Geology, University of Illinois at Urbana-Champaign.*

Felix Chayes (d. 1993). *Petrologist, Geophysical Laboratory, Carnegie Institution of Washington, D.C., 1947–86.*

Robert Griffin Coleman. *Emeritus Professor of Geology, Stanford University, Calif.*

Paul E. Damon. *Emeritus Professor of Geosciences; Chief Scientist, Laboratory of Isotope Geochemistry, University of Arizona, Tucson.*

Hubert G. Davis (deceased). *Staff Scientist and Principal Investigator, Energy and Environment Division, Lawrence Berkeley Laboratory, University of California.*

George A. Dawson. *Emeritus Professor of Atmospheric Sciences, University of Arizona, Tucson.*

George W. DeVore. *Professor of Geology, Florida State University, Tallahassee, 1961–91.*

Ernest George Ehlers. *Emeritus Professor of Mineralogy, Ohio State University, Columbus.*

David B. Enfield. *Research Oceanographer, Atlantic Oceanographic and Meteorological Laboratory, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Miami.*

Richard Kempton Estelow. *Former Business Manager, Columbian Carbon Company, Princeton, N.J.*

George Tobias Faust. *Former Mineralogist-Petrologist, Division of Experimental Geochemistry and Mineralogy, Geological Survey, U.S. Department of the Interior, Washington, D.C.*

Carroll Lane Fenton (d. 1969). *Author of Our Amazing Earth and others.*

Mildred Adams Fenton. *Coauthor of Story of the Great Geologists and others.*

Robert G. Fleagle. *Emeritus Professor of Atmospheric Sciences, University of Washington, Seattle.*

Robert Louis Folk. *Dave P. Carlton Professor Emeritus of Geology, University of Texas at Austin.*

Clifford Frondel. *Professor of Mineralogy, Harvard University, 1954–77.*

Fritiof Melvin Fryxell (d. 1986). *Professor of Geology, Augustana College, Rock Island, Ill., 1929–73.*

Julian R. Goldsmith. *Charles E. Merriam Distinguished Service Professor Emeritus of Geochemistry, University of Chicago.*

Allan Grierson. *Former Senior Lecturer in Mining, Royal School of Mines, Imperial College of Science and Technology, University of London.*

John W. Harbaugh. *Professor of Geological Sciences, Stanford University, Calif.*

Walter Brian Harland. *Fellow of Gonville and Caius College, Cambridge; former Reader in Tectonic Geology, University of Cambridge.*

Herbert Edwin Hawkes, Jr. *Professor of Mineral Exploration, University of California, Berkeley, 1957–65.*

E. William Heinrich. *Emeritus Professor of Geological Science, University of Michigan, Ann Arbor.*

Donald Munro Henderson. *Professor of Geology, University of Illinois at Urbana-Champaign.*

Benjamin M. Herman. *Professor of Atmospheric Sciences, University of Arizona, Tucson.*

Jörgen Holmboe (deceased). *Professor of Meteorology, University of California, Los Angeles, 1943–70.*

Floyd Allen Hummel. *Emeritus Professor of Ceramic Science, Pennsylvania State University, University Park.*

Charles B. Hunt. *Professor of Geology, Johns Hopkins University, Baltimore, 1961–73.*

Cornelius Searle Hurlbut. *Emeritus Professor of Mineralogy, Harvard University.*

Takashi Ichiye. *Emeritus Professor of Oceanography, Texas A&M University, College Station.*

Richard H. Jahns (d. 1983). *Crook Professor of Geology and Applied Earth Sciences, Stanford University, Calif.*

George Clayton Kennedy. *Professor of Geology and Geochemistry, University of California, Los Angeles, 1969–80.*

Léo F. Laporte. *Professor of Earth Sciences, University of California, Santa Cruz.*

Austin Long. *Professor of Geosciences, University of Arizona, Tucson.*

Duncan McConnell. *Emeritus Professor of Dentistry and of Mineralogy, Ohio State University, Columbus.*

Wayne Anthony McCurdy. *Former Head, Division of Mining and Preparation, Office of Coal Research, U.S. Department of the Interior, Washington, D.C.*

D. Clay McDowell. *Former Professor of Meteorology; former Director, Institute of Tropical Meteorology, University of Puerto Rico, Río Piedras.*

Wayne E. McGovern. *Mesoscale Branch Chief, National Weather Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Silver Spring, Md.*

Richard W. Macomber. *Professor of Physics, Brooklyn Campus, Long Island University, Brooklyn, N.Y.*

Rolland Lee Mays. *Director of Research, Linde Division, Union Carbide Corporation, Tarrytown, N.Y., 1978–81.*

J. Robert Moore (d. 1995). *Director, Marine Science Institute; Professor of Marine Studies, University of Texas at Austin, 1979–82.*

Paul B. Moore. *Professor of Mineralogy and Crystallography, University of Chicago.*

Morris Neiburger (deceased). *Professor of Meteorology, University of California, Los Angeles, 1954–78.*

Jehuda Neumann. *Emeritus Professor of Atmospheric Sciences, Hebrew University of Jerusalem.*

Bert E. Nordlie. *Professor of Geology and Chairman, Department of Earth Sciences, Iowa State University, Ames.*

Frederick J. North. *Formerly Keeper of the Department of Geology, National Museum of Wales.*

John Claud Trewinard Oates (d. 1990). *Reader in Historical Bibliography, University of Cambridge, 1972–79; Fellow of Darwin College, Cambridge, 1964–79.*

Gerald D. O'Brien. *Staff Geologist, Shell Oil Company.*

Charles W. Ott. *Freelance writer.*

Robert Joseph Pafford, Jr. *Regional Director, Bureau of Reclamation, U.S. Department of the Interior, Sacramento, Calif., 1963–73.*

Hans Arnold Albert Panofsky (d. 1988). *Evan Pugh Research Professor of Atmospheric Sciences, Pennsylvania State University, University Park, 1966–82.*

Ralph Brazelton Peck. *Emeritus Professor of Foundation Engineering, University of Illinois at Urbana-Champaign.*

Márton Pécsi. *Director, Geographical Research Institute, Hungarian Academy of Sciences, Budapest.*

F.J. Pettijohn. *Emeritus Professor of Geology, Johns Hopkins University, Baltimore.*

Hans Ramberg. *Professor and Head, Department of Mineralogy and Petrology, University of Uppsala, Swed.*

Lewis S. Ramsdell (d. 1975). *Professor of Mineralogy, University of Michigan, Ann Arbor, 1945–61.*

Kelvin S. Rodolfo. *Associate Professor of Geological Sciences, University of Illinois at Chicago.*

Edwin Woods Roedder. *Associate, Department of Earth and Planetary Sciences, Harvard University. Geologist, Experimental Geochemistry and Mineralogy Branch, Geological Survey, U.S. Department of the Interior, Reston, Va., 1962–87.*

Della Roy. *Professor of Materials Science, Pennsylvania State University, University Park.*

Rustum Roy. *Evan Pugh Professor of the Solid State; Director, Science, Technology, and Society Program, Pennsylvania State University, University Park.*

George Richard Rumney. *Emeritus Professor of Geography, University of Connecticut, Storrs.*

Maurice L. Schwartz. *Emeritus Professor of Geology, Western Washington University, Bellingham.*

William D. Sellers. *Professor and Head, Department of Atmospheric Sciences; Director, Institute of Atmospheric Physics, University of Arizona, Tucson.*

Nicholas M. Short. *Research Scientist, Geophysics Branch, Laboratory for Earth Sciences, Goddard Space Flight Center, National Aeronautics and Space Administration, Greenbelt, Md.*

Sol Robert Silverman. *Senior Research Associate, Chevron Oil Field Research Company, La Habra, Calif.*

Joseph V. Smith. *Louis Block Professor of Physical Sciences, University of Chicago.*

Ian M. Steele. *Senior Research Associate, Department of Geophysical Sciences, University of Chicago.*

John S. Sumner. *Emeritus Professor of Geosciences, University of Arizona, Tucson.*

Reginald C. Sutcliffe (d. 1991). *Professor of Meteorology, University of Reading, Eng., 1965–70.*

Sir Graham Sutton (d. 1977). *Vice President, University College of Wales, Aberystwyth, 1967–77. Director General, Meteorological Office, London, 1953–65.*

George S. Switzer. *Emeritus Curator, Department of Mineral Sciences, Smithsonian Institution, Washington, D.C.*

John M. Teal. *Senior Scientist, Woods Hole Oceanographic Institution, Mass.*

Thomas Prence Thayer. *Former Geologist, Eastern Mineral Resources Branch, Geological Survey, U.S. Department of the Interior, Washington, D.C.*

James Burleigh Thompson, Jr. *Sturgis Hooper Professor of Geology, Harvard University.*

Charles Warren Thornthwaite (d. 1963). *Director, Laboratory of Climatology, Centerton, N.J. Principal Climatologist, U.S. Soil Conservation Service, 1935–46.*

Cecil Edgar Tilley (d. 1973). *Professor of Mineralogy and Petrology, University of Cambridge, 1931–61.*

Karl M. Waage. *Emeritus Professor of Geology; Emeritus Curator of Invertebrate Paleontology, Peabody Museum of Natural History, Yale University.*

Howel Williams (d. 1980). *Professor of Geology, University of California, Berkeley, 1945–70.*

Richard F. Wilson. *Former Associate Professor of Geosciences, University of Arizona, Tucson.*

Brian Frederick Windley. *Professor of Geology, University of Leicester, Eng.*

Donald Wolberg. *Paleontologist, New Mexico Bureau of Mines and Mineral Resources, Socorro.*

W.A. Wooster. *Former Director, Crystal Structures Ltd., Cambridge, Eng.*

Jerome J. Wright. *Chief Hydrologist, Metropolitan Utilities Management Agency, Tucson, 1974–78. Associate Professor of Geosciences, University of Arizona, Tucson, 1966–74.*

Vsevolod Pavlovich Zenkovich. *Former Head of Shore Department, Institute of Oceanology, Academy of Sciences of the U.S.S.R., Moscow.*

Garland Edward Allen. *Professor of Biology, Washington University, St. Louis, Mo.*

Angeles Alvaríño. *Fishery Research Biologist, National Marine Fisheries Service, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, La Jolla, Calif., 1970–87.*

George Sherman Avery (d. 1994). *Director, Brooklyn Botanic Garden, N.Y., 1972–80.*

Edward William Baker. *Acarologist, Agricultural Research Service, U.S. Department of Agriculture, Beltsville, Md., 1958–87.*

Fred Alexander Barkley. *Former Professor of Biology, Northeastern University, Boston.*

J. Laurens Barnard. *Curator, Division of Crustacea, Smithsonian Institution, Washington, D.C.*

Roger Lyman Batten. *Professor of Geology, Columbia University. Curator, American Museum of Natural History, New York City.*

Dmitri Konstantinovich Belyaev. *Former Director, Institute of Cytology and Genetics; Chief of the Laboratory of Evolution Genetics, Siberian Department, Academy of Sciences of the U.S.S.R., Novosibirsk.*

Lyman Benson (d. 1993). *Professor of Botany, Pomona College, Claremont, Calif., 1949–74.*

Victor Rickman Boswell. *Assistant Director, Crops Research Division, U.S. Department of Agriculture, Plant Industry Station, Beltsville, Md., 1965–68.*

Andrew Gavin Brown. *Former Senior Experimental Officer, Department of Applied Genetics, John Innes Institute, Norwich, Eng.*

Frank A. Brown, Jr. (d. 1983). *Morrison Professor of Biology, Northwestern University, Evanston, Ill., 1956–76.*

John Bonner Buck. *Chief, Section of Comparative Physiology, National Institutes of Health, Bethesda, Md., 1975–85.*

F.M. Carpenter (d. 1994). *Fisher Professor of Natural History, Harvard University, 1969–73; Curator of Fossil Insects, Museum of Comparative Zoology, 1936–72.*

Jackson Leaphart Cartter. *Director, U.S. Regional Soybean Laboratory, U.S. Department of Agriculture, Urbana, Ill., 1950–65.*

Robert H. Catlett. *Former Associate Professor of Zoology, San Diego State College, Calif.*

Ailsa McGowan Clark. *Principal Scientific Officer, Department of Zoology, British Museum (Natural History), London.*

Phil Clark. *Freelance writer on botany.*

Part Three. Life on Earth

Constantine John Alexopoulos (d. 1986). *Professor of Botany, University of Texas at Austin, 1962–77.*

Arthur L. Cohen. *Emeritus Professor of Botany and of Biological Sciences, Washington State University, Pullman; Director, Electron Microscope Center, 1962–79.*

Ira Judson Condit (d. 1981). *Professor of Subtropical Horticulture, University of California, Citrus Research Center, Riverside.*

Patricia L. Cook. *Principal Scientific Officer, Department of Zoology, British Museum (Natural History), London.*

Charles E. Cornelius, D.V.M. *Emeritus Professor of Molecular Biosciences, School of Veterinary Medicine, University of California, Davis; Director, California Primate Research Center, 1981–87.*

Paul F.S. Cornelius. *Principal Scientific Officer, Department of Zoology, British Museum (Natural History), London.*

Donovan Stewart Correll (d. 1983). *Program Director, Division of Biological and Medical Sciences, National Science Foundation. Chief Botanist; Head of Botanical Laboratory, Texas Research Foundation, Renner, Texas, 1956–71.*

Francis E.G. Cox. *Professor of Zoology, King's College, University of London.*

Alistair Cameron Crombie (d. 1996). *Senior Lecturer in the History of Science, University of Oxford, 1953–83.*

Frank P. Cullinan (deceased). *Associate Director, Crops Research Division, Plant Industry Station, U.S. Department of Agriculture, Beltsville, Md.*

R.L. Cushing. *Vice President and Secretary, Hawaiian Sugar Planters Association, Honolulu, 1966–79; Director, Experiment Station, 1963–79.*

George McMillan Darrow (deceased). *Principal Horticulturist in Charge of Small Fruit Investigations, U.S. Department of Agriculture, Beltsville, Md., 1954–57.*

Charles C. Davis. *Emeritus Professor of Biology, Memorial University of Newfoundland, St. John's.*

Robert H. Denison (d. 1985). *Curator of Fossil Fishes, Field Museum of Natural History, Chicago, 1948–71.*

Bernard Dixon. *Science writer. Editor, New Scientist, 1969–79.*

Elizabeth C. Dudley. *Research Associate, Zoology, University of Maryland, College Park.*

L.C. Dunn (d. 1974). *Professor of Zoology, 1928–62; Senior Research Associate in Biological Sciences, 1962–74, Columbia University.*

Stephen Porter Dunn. *Director of Research, Highgate Road Social Science Research Station, Inc., Berkeley, Calif.*

O.J. Eigsti. *Emeritus Professor of Botany, Chicago State University.*

Alfred E. Emerson (d. 1976). *Professor of Biology, University of Chicago, 1934–62.*

Richard Fifield. *Executive Editor, New Scientist.*

Claudio Gilberto Froehlich. *Associate Professor of Zoology, Institute of Biosciences, University of São Paulo, Braz.*

Marshall Gates. *Charles Frederick Houghton Professor Emeritus of Chemistry, University of Rochester, N.Y.*

J. Whitfield Gibbons. *Professor of Ecology; Senior Research Scientist, Savannah River Ecology Laboratory, University of Georgia, Aiken, S.C.*

David Ian Gibson. *Principal Scientific Officer, Department of Zoology, British Museum (Natural History), London.*

Ray Gibson. *Professor of Marine Biology, Liverpool John Moores University, Eng.*

Ernest M. Gifford. *Emeritus Professor of Botany, University of California, Davis.*

Clarence James Goodnight (d. 1987). *Professor of Biology, Western Michigan University, Kalamazoo, 1965–84.*

Marie Louise Goodnight. *Freelance writer and researcher. Instructor in Biological Sciences, Purdue University, West Lafayette, Ind., 1946–65.*

Andres Goth, M.D. (deceased). *Professor of Pharmacology, University of Texas Southwestern Medical School at Dallas.*

Edna R. Green. *Former Head, Science Department, Philadelphia High School for Girls.*

James Green. *Emeritus Professor of Zoology, Queen Mary College, University of London.*

Per H.H. Halldal. *Former Professor of Plant Physiology, University of Oslo.*

Yata Haneda. *Curator, Yokosuka City Museum, Japan. Coeditor of Bioluminescence in Progress.*

Sir Alister C. Hardy (d. 1985). *Linacre Professor of Zoology, University of Oxford, 1946–61.*

Ellwood Scott Harrar (d. 1975). *James B. Duke Professor of Wood Science, Duke University, Durham, N.C., 1967–74.*

Hudson Thomas Hartmann. *Emeritus Professor of Pomology, University of California, Davis.*

Joel W(alker) Hedgpeth. *Emeritus Professor of Oceanography, Oregon State University, Newport; Head, Yaquina Biological Laboratory, Marine Science Center, 1965–74.*

Edward Hindle (d. 1973). *Scientific Director, Zoological Society of London, 1944–51. Regius Professor of Zoology, University of Glasgow, 1935–43.*

Cecil Arthur Hoare (d. 1984). *Wellcome Research Fellow, Wellcome Laboratories of Tropical Medicine, London, 1957–70; Head, Protozoological Department, 1923–57.*

Walter Henricks Hodge. *Section Head for Ecological and Systematic Botany, National Science Foundation, Washington, D.C., 1970–73.*

Richard Lawrence Hoffman. *Professor of Biology, Radford University, Va.*

Turner Harcourt Hopper. *Chief, Oilseed Crops Laboratory, Southern Utilization Research and Development Division, Agricultural Research Service, New Orleans, 1958–65.*

Carl L. Hubbs (d. 1979). *Professor of Biology, Scripps Institution of Oceanography, University of California, San Diego, at La Jolla, 1944–69.*

Clark Hubbs. *Professor of Zoology, University of Texas at Austin.*

Hilary Mary Hughes. *Horticulturalist, Ministry of Agriculture, Wolverhampton, Eng.*

Laurence Irving (d. 1979). *Professor of Zoophysiology, University of Alaska, Fairbanks, 1962–74; Advisory Scientific Director, Institute of Arctic Biology, 1966–74.*

Artemy V. Ivanov. *Former Head, Laboratory of Evolutionary Morphology, Zoological Institute, Academy of Sciences of the U.S.S.R., Leningrad. Former Professor of Zoology, Leningrad A.A. Zhdanov State University.*

David Starr Jordan, M.D. (d. 1931). *Chancellor, Stanford University, Calif., 1913–16; President, 1891–1913. President, Indiana University, Bloomington, 1885–91; Professor of Zoology, 1879–85.*

Theodor (Karl) Just (d. 1960). *Chief Curator, Department of Botany, Field Museum of Natural History, Chicago.*

Chester Scott Keefer, M.D. (d. 1972). *Wade Professor of Medicine, Boston University, 1940–64.*

Keith R. Kelson. *Former Acting Assistant Director for Education and Executive Assistant, National Science Foundation, Washington, D.C. Coauthor of The Mammals of North America.*

Vera V. Khvostova (d. 1977). *Chief, Laboratory of Cytogenetics, Institute of Cytology and Genetics, Siberian Department, Academy of Sciences of the U.S.S.R., Novosibirsk.*

James Edward Knott (deceased). *Professor and Chairman, Department of Vegetable Crops, University of California, Davis, 1940–64.*

Paulden Ford Knowles. *Emeritus Professor of Agronomy, University of California, Davis.*

Barry Koffler. *Freelance writer on zoology and ecology.*

Sir Hans (Adolf) Krebs (d. 1981). *Whitley Professor of Biochemistry, University of Oxford, 1954–67. Cowinner, Nobel Prize for Physiology or Medicine, 1953.*

Christine Laning. *Freelance writer on botany.*

Morris Cecil Leikind (d. 1976). *Scientist Administrator, National Clearinghouse for Mental Health Information, National Institutes of Health, Bethesda, Md., 1963–66.*

Roger John Lincoln. *Principal Scientific Officer, Department of Zoology, British Museum (Natural History), London.*

Thomas D. Luckey. *Professor of Biochemistry, University of Missouri, Columbia, 1954–84.*

Joseph Colvin McDaniel. *Former Assistant Professor of Horticulture (Research), University of Illinois, Urbana.*

John Robert Magness. *Chief, Fruit and Nut Crops Research Branch, U.S. Department of Agriculture, U.S. Plant Industry Station, Beltsville, Md., 1953–59.*

Leonard Harrison Matthews (d. 1986). *Scientific Director, Zoological Society of London, 1951–66.*

Florence Moog. *Rebstock Professor Emeritus of Biology, Washington University, St. Louis, Mo.*

Thomas Edwin Moore. *Curator of Insects, Museum of Zoology; Professor of Zoology, University of Michigan, Ann Arbor.*

Ernst Trier Mörch, M.D. *Anesthesiologist, Nassau General Hospital, Ferdinandina Beach, Fla. Former Clinical Professor of Surgery, University of Illinois at Chicago.*

James William Moulder. *Emeritus Professor of Molecular Genetics and Cell Biology, University of Chicago.*

Walter Conrad Muenscher (d. 1963). *Professor of Botany, Cornell University, Ithaca, N.Y.*

Carl F.W. Muesebeck. *Honorary Collaborator, U.S. Department of Agriculture and U.S. National Museum, 1954–65. Chief, Division of Insect Identification, U.S. Department of Agriculture, 1935–54.*

John Spangler Nicholas (d. 1963). *Sterling Professor of Biology, Yale University, 1939–63.*

George Torao Okita. *Professor of Pharmacology, Northwestern University, Chicago.*

Everett C. Olson (d. 1993). *Professor of Zoology, University of California, Los Angeles, 1969–78.*

Jane M. Oppenheimer. *Emeritus Professor of Biology and the History of Science, Bryn Mawr College, Pa.*

Gilbert Fred Otto (d. 1992). *Professor of Zoology, University of Maryland, College Park, 1966–72.*

Thomas G. Overmire. *Head, Office of Project Management, Kuwait Institute for Scientific Research. Author of Homeostatic Regulation.*

Richard Tudor Owen. *Advisory Pharmacologist, Scientific Services Division, Wellcome Foundation Ltd., Crewe, Eng.*

Gordon Paterson. *Higher Scientific Officer, Department of Zoology, British Museum (Natural History), London.*

Fernandus Payne (deceased). *Professor of Zoology, Indiana University, Bloomington, 1919–51.*

Michael J. Pelczar, Jr. *Emeritus Vice President for Graduate Studies and Research; Emeritus Professor of Microbiology, University of Maryland, College Park.*

Bernard George Peters (d. 1967). *Professor of Parasitology, Imperial College of Science and Technology, University of London, 1955–67.*

Sir Rudolph Albert Peters (d. 1982). *Whitley Professor of Biochemistry, University of Oxford, 1923–54. Head, Biochemistry Department, Agricultural Research Council, Institute of Animal Physiology, Babraham, Cambridge, Eng., 1954–59.*

Richard W. Pohl. *Emeritus Professor of Botany, Iowa State University, Ames.*

(Frederick) Wilson Popenoe. *Director Emeritus, Escuela Agrícola Panamericana, Tegucigalpa, Honduras. Author of Manual of Tropical and Subtropical Fruits and others.*

John Ramsbottom (d. 1974). *Keeper, Department of Botany, British Museum (Natural History), London, 1930–50.*

Austin L. Rand (d. 1982). *Research Associate, Archbold Biological Station, Lake Placid, Fla. Chief Curator of Zoology, Field Museum of Natural History, Chicago, 1955–70.*

Gloria Robinson. *Research Affiliate in the History of Medicine, Yale University.*

Alfred S. Romer (d. 1973). *Alexander Agassiz Professor of Zoology, Harvard University, 1947–65.*

Anthony H. Rose (d. 1993). *Professor of Microbiology, University of Bath, Eng., 1968–93.*

Herbert Holdsworth Ross (d. 1978). *Professor of Entomology, University of Georgia, Athens.*

Bradley Titus Scheer. *Emeritus Professor of Biology, University of Oregon, Eugene.*

Aaron J. Sharp. *Alumni Distinguished Service Professor Emeritus of Botany, University of Tennessee, Knoxville.*

Malcolm C. Shurtleff, Jr. *Professor of Plant Pathology; Extension Plant Pathologist, University of Illinois at Urbana-Champaign.*

Reginald W. Sims. *Head, Annelida Section, Department of Zoology, British Museum (Natural History), London.*

Walton B. Sinclair (deceased). *Professor of Biochemistry, University of California, Riverside, 1946–68.*

Robert Leo Smith. *Professor of Wildlife Biology and Ecology, West Virginia University, Morgantown.*

Howard James Stains. *Professor of Zoology, Southern Illinois University, Carbondale.*

William Campbell Steere (d. 1988). *Professor of Botany, Columbia University, 1958–75. President, New York Botanical Garden, Bronx, 1970–72; Director, 1958–70.*

C.D. Stein, V.M.D. (d. 1965). *Consultant, Animal Disease Eradication Division, Agricultural Research Service, U.S. Department of Agriculture.*

William Louis Stern. *Professor of Botany, University of Florida, Gainesville.*

Robert W. Storer. *Emeritus Professor of Zoology, University of Michigan, Ann Arbor; Curator of Birds, Museum of Zoology, 1956–85.*

William Coffield Summers, M.D. *Professor of Therapeutic Radiology, Molecular Biophysics and Biochemistry, and Human Genetics, Yale University.*

William H. Taliaferro (d. 1973). *Eliakim Hastings Moore Distinguished Service Professor of Microbiology, University of Chicago, 1954–60. Senior Immunologist, Division of Biological and Medical Research, Argonne National Laboratory, Argonne, Ill., 1960–69.*

John David Taylor. *Head, Mollusca Section, Zoology Department, British Museum (Natural History), London.*

Norman Taylor (d. 1967). *Assistant Curator, New York Botanical Garden, 1905–11. Author of Guide to Garden Flowers and others.*

John W. Thieret. *Professor of Botany, Northern Kentucky University, Highland Heights.*

Frederick Ichiro Tsuji. *Research Biochemist, Marine Biology Research Division, Scripps Institution of Oceanography, University of California, San Diego, at La Jolla.*

Robert Templeton Van Tress. *Former Horticulturist, Chicago Park District.*

Paul Dirks Voth (d. 1992). *Professor of Botany, University of Chicago, 1948–70.*

David B. Wake. *Director, Museum of Vertebrate Zoology; John and Margaret Gompertz Professor of Integrative Biology, University of California, Berkeley.*

Lionel A. Walford (d. 1979). *Director, Sandy Hook Marine Laboratory, Highlands, N.J., 1960–71; Senior Scientist, 1971–74.*

Stanley H. Weitzman. *Curator of Fishes, Division of Fishes, National Museum of Natural History, Smithsonian Institution, Washington, D.C.*

Rupert L. Wenzel. *Emeritus Curator of Insects, Field Museum of Natural History, Chicago; Chairman, Department of Zoology, 1970–77.*

Geoffrey Buckle West (d. 1991). *Reader in Pharmacology, North East London Polytechnic, 1970–82.*

George W. Wharton (d. 1990). *Professor of Entomology, Ohio State University, Columbus, 1961–76; Director, Acarology Laboratory, 1969–76.*

Donald Walter Wilkie. *Director, Aquarium-Museum, Scripps Institution of Oceanography, University of California, San Diego.*

Gordon Roy Williams. *Head, New Zealand Wildlife Service, Department of Internal Affairs, Wellington.*

Louis O. Williams. *Emeritus Curator of Botany, Field Museum of Natural History, Chicago.*

A.J. Winkler. *Emeritus Professor of Viticulture and Emeritus Viticulturist, College of Agriculture, University of California, Davis.*

Keith Arthur John Wise. *Entomologist, Auckland Institute and Museum, N.Z.*

Dorothea Woodruff. *Herbarium Associate and Research Assistant, Department of Biology, University of Utah, Salt Lake City.*

A.H. Wright (d. 1966). *Professor of Agronomy, University of Wisconsin, Madison, 1931–57.*

Kanichiro Yashiroda. *Proprietor, Yashiroda Acclimatization Garden, Tonosho, Japan. Author of Bonsai: Japanese Miniature Trees.*

Richard Charles York. *Instructor of Horticulture and Education, McHenry County College, Crystal Lake, Ill. Former Associate Editor, Biology, Encyclopædia Britannica, Chicago.*

Wolfram Winfried Zillig. *Director, Molecular Biology of Gene Expression Department, Max Planck Institute for Biochemistry, Munich.*

Martin Huldrych Zimmermann (d. 1984). *Charles Bullard Professor of Forestry, Harvard University; Director, Harvard Forest, Petersham, 1970–84.*

Solly Zuckerman, Baron Zuckerman (d. 1993). *Sands Cox Professor of Anatomy, University of Birmingham, Eng., 1943–68. President, Zoological Society of London, 1977–84.*

Part Four. Human Life

Fred Lyman Adair, M.D. (d. 1972). *Mary Campau Ryerson Professor of Obstetrics and Gynecology, University of Chicago, 1931–42.*

Rodolfo Almeida Pintos (deceased). *Phthisiologist, Institute of Epidemiology and Contagious Diseases, School of Medicine, University of Montevideo, Uruguay.*

W.A.D. Anderson, M.D. *Emeritus Professor of Pathology, School of Medicine, University of Miami.*

Alfred Alvin Angrist, M.D. (d. 1984). *Professor of Pathology, Albert Einstein College of Medicine, Yeshiva University, Bronx, N.Y.*

(Edith Kathleen) Charlotte Banks. *Former Lecturer in Psychology, University College, University of London.*

M. Robert Barnett. *Consultant, American Foundation for the Blind, New York City; Executive Director, 1949–74.*

Edward W. Barrett (d. 1989). *Dean, Graduate School of Journalism, Columbia University, 1956–68. Founder, Columbia Journalism Review.*

Frank X. Barron. *Professor of Psychology, University of California, Santa Cruz.*

Sir Frederic Charles Bartlett (d. 1969). *Professor of Experimental Psychology, University of Cambridge, 1931–52; Director, Psychological Laboratory, 1922–52.*

S. Howard Bartley (d. 1988). *Professor of Psychology, Michigan State University, East Lansing, 1947–71.*

David V. Bates, M.D. *Emeritus Professor of Medicine, University of British Columbia, Vancouver.*

William B. Bean, M.D. (d. 1989). *Professor of Medicine, University of Iowa, Iowa City, 1948–70. Editor in Chief, Archives of Internal Medicine, 1962–67.*

Marc Oliver Beem, M.D. *Emeritus Professor of Pediatrics, University of Chicago.*

Walter Reginald Bett. *Former Medical Editor, Wm. Douglas McAdams, Inc., New York City. Author of The Infirmities of Genius and others.*

Emma Mary Birch. *Former Head Occupational Therapist, Royal Free Hospital Group, London.*

Edwin Garrigues Boring (d. 1968). *Edgar Pierce Professor of Psychology, Harvard University, 1956–57; Professor of Psychology, 1928–56.*

Arthur Hills Brayfield. *Emeritus Professor of Psychology, Claremont Graduate School, Calif.*

Henry W. Brosin, M.D. *Professor of Psychiatry, University of Arizona, Tucson.*

Carroll L. Bryant. *Director, Office of Publications, American National Red Cross, 1954–60.*

William Burrows (d. 1978). *Professor of Microbiology, University of Chicago, 1947–73.*

Sir Cyril Lodowic Burt (d. 1971). *Professor of Psychology, University College, University of London, 1931–50.*

Douglas E. Busby, M.D. *Medical Director, Downtown Healthcare Services, Lutheran Medical Center, Cleveland.*

Donald E. Cassels, M.D. (d. 1981). *Professor of Pediatrics, University of Chicago.*

Andrew Barnett Christie, M.D. (d. 1991). *Physician, Fazakerley Hospital, Liverpool, 1946–74. Former Head, Department of Infectious Diseases, University of Liverpool.*

Conrad Chyatte. *Associate Professor of Psychology, DePaul University, Chicago, 1952–76.*

Leighton E. Cluff, M.D. *Clinical Professor of Medicine, University of Florida, Gainesville. President, Robert Wood Johnson Foundation, Princeton, N.J., 1986–90.*

David W. Crabb. *Emeritus Professor of Anthropology, Princeton University.*

Paul Frederic Crane. *Professor of Physiology, Rockefeller University, New York City.*

Jean-Marie Crépin. *Former Electroradiologist, Léopold Bellan Hospital, Paris.*

Edward P. Crowell, D.O. *Former Executive Director, American Osteopathic Association, Chicago.*

Liza Dahlby. *Translator and freelance writer.*

Robert Croly Darling, M.D. *Simon Baruch Professor Emeritus of Rehabilitation Medicine, Columbia University.*

Henry P. David. *Director, Transnational Family Research Institute, Bethesda, Md. Associate Clinical Professor of Psychology, School of Medicine, University of Maryland, Baltimore.*

Peter P.H. De Bruyn, M.D. *Emeritus Professor of Anatomy, University of Chicago.*

Susan J. Decker. *Freelance writer on medical topics. Electron Microscopist, Department of Biology, University of Illinois, Chicago.*

William N. Dember. *Professor of Psychology, University of Cincinnati, Ohio.*

- Helen Aird Dickie, M.D.** (d. 1988). *Professor of Medicine, University of Wisconsin, Madison, 1955-83.*
- John Holmes Dingle, M.D.** (d. 1973). *Elisabeth Severance Prentiss Professor of Preventive Medicine and Professor of Medicine, Case Western Reserve University, Cleveland.*
- Joseph Lewi Donhauser** (d. 1964). *Professor of Surgery, Albany Medical College, N.Y. Senior Surgeon, Albany Medical Center Hospital.*
- Roy Melvin Dorcus** (d. 1968). *Professor of Psychology, 1944-65; Dean, Division of Life Sciences, University of California, Los Angeles, 1950-63.*
- James Russell Eckman** (d. 1987). *Senior Consultant, Section of Publications, Mayo Clinic, Rochester, Minn., 1965-87.*
- Lillian Eichelberger.** *Emeritus Professor of Biochemistry, University of Chicago.*
- Kendall Emerson, Jr., M.D.** *Emeritus Professor of Medicine, Harvard University.*
- William Fisher Enneking, M.D.** *Distinguished Service Professor of Orthopaedic Surgery, University of Florida, Gainesville.*
- George Hoben Estabrooks** (d. 1974). *Professor of Psychology, Colgate University, Hamilton, N.Y., 1935-64.*
- Hans Jurgen Eysenck.** *Emeritus Professor of Psychology, Institute of Psychiatry, University of London.*
- Ernest Carroll Faust** (d. 1978). *Professor of Parasitology, Tulane University, New Orleans.*
- Louis B. Flexner, M.D.** (d. 1996). *Professor of Anatomy, University of Pennsylvania, Philadelphia, 1951-75.*
- Anna Freud** (d. 1982). *Director of the Hampstead Child Therapy Course and Clinic, London, 1952-82. Author of The Ego and the Mechanisms of Defence and others.*
- William F. Ganong, M.D.** *Lange Professor of Physiology, University of California, San Francisco.*
- Esther Garvey.** *Registered Nurse, specializing in geriatric care.*
- Jacob Warren Getzels.** *R. Wendell Harrison Distinguished Service Professor Emeritus of Educational Psychology, University of Chicago.*
- Edward Girden.** *Emeritus Professor of Psychology, Brooklyn College, City University of New York.*
- Francis Byron Gordon, M.D.** (d. 1973). *Director, Department of Microbiology, Naval Medical Research Institute, Bethesda, Md., 1962-72.*
- Ashton Graybiel, M.D.** (d. 1995). *Chief Scientific Advisor, Naval Aerospace Medical Research Laboratory, Naval Air Station, Pensacola, Fla., 1981-95; Director of Research, 1945-70.*
- Douglas James Guthrie, M.D.** (d. 1975). *Medical historian. Lecturer on the History of Medicine, University of Edinburgh, 1945-56.*
- Ward Campbell Halstead** (d. 1969). *Professor, Department of Psychology and Medicine, University of Chicago, 1946-69.*
- A. Gordon Hammer.** *Emeritus Professor of Psychology, Macquarie University, North Ryde, Australia.*
- Henry Nelson Harkins, M.D.** (d. 1967). *Professor of Surgery, University of Washington, 1947-67; Surgeon-in-Chief, University Hospital, Seattle, 1957-64.*
- Sir Donald F.N. Harrison, M.D.** *Emeritus Professor of Laryngology and Otology, University of London.*
- Réjane M. Harvey, M.D.** *Richards Professor Emeritus of Medicine, Columbia University.*
- A. Waller Hastings.** *Medical writer and editor.*
- R.L. Hay.** *Professor of Geology, University of California, Berkeley. Author of Geology of the Olduvai Gorge.*
- Ralph William Heine.** *Emeritus Professor of Psychology, University of Michigan, Ann Arbor; Director, Institute for Human Adjustment, 1974-78.*
- Roger Moss Herriott** (d. 1992). *Professor of Biochemistry, School of Hygiene and Public Health, Johns Hopkins University, Baltimore.*
- Nicholas Carr Hightower, M.D.** *Senior Consultant, Department of Gastroenterology, Scott and White Clinic and Scott and White Memorial Hospital, Temple, Texas.*
- Constance Holden.** *Staff writer, Science magazine.*
- Howard Francis Hunt.** *Clinical Professor of Psychology in Psychiatry, Cornell University Medical College, New York City.*
- Stanley W. Jacob, M.D.** *Gerlinger Professor of Surgery, Oregon Health Sciences University, Portland.*
- Saul Jarcho, M.D.** *Medical historian. Former Consultant to the Surgeon General of the U.S. Army and to the National Institutes of Health, Bethesda, Md.*
- Herbert Henry Jasper, M.D.** *Emeritus Professor of Neurophysiology, University of Montreal.*
- Franklin Davis Johnston, M.D.** (d. 1971). *Professor of Internal Medicine, University of Michigan, Ann Arbor.*
- J.R. Kantor** (d. 1984). *Professor of Psychology, Indiana University, Bloomington, 1923-59.*
- George Alexander Kelly** (d. 1967). *Professor of Psychology, Brandeis University, Waltham, Mass., 1965-67.*
- Pearl L. Kendrick** (d. 1980). *Lecturer, Department of Epidemiology, School of Public Health, University of Michigan, Ann Arbor, 1951-60.*
- Meave Kenny, M.D.** *Former University Reader in Obstetrics and Gynecology, Postgraduate Medical School of London.*
- John Franklin Kenward, M.D.** (d. 1989). *Associate Professor of Pediatrics and Psychiatry, University of Chicago, 1957-78.*
- Thomas Edward Keys.** *Emeritus Professor of the History of Medicine, Mayo Graduate School of Medicine, University of Minnesota, Rochester.*
- Joseph Barnett Kirsner, M.D.** *Louis Block Distinguished Service Professor of Medicine, University of Chicago.*
- Arthur Paul Klotz, M.D.** *Director of Research, Biogerontology Research Institute, Boswell Memorial Hospital, Sun City, Ariz. Professor of Medicine, University of Kansas, Kansas City, 1962-75; Head of Section of Gastroenterology, 1954-75.*
- Heinrich Klüver** (d. 1979). *Sewell L. Avery Distinguished Service Professor of Biological Psychology, University of Chicago, 1957-62.*
- John Knowelden, M.D.** *Professor of Community Medicine, University of Sheffield, Eng, 1960-84.*
- Helen Lois Koch** (d. 1977). *Professor of Child Psychology, University of Chicago, 1945-60.*
- Sigmund Koch** (d. 1996). *Professor of Psychology and Philosophy, Boston University.*
- Dieter Koch-Weser, M.D.** *Professor of Preventive and Social Medicine; Associate Dean for International Programs, Medical School, Harvard University.*
- Sheldon Jerome Korchin.** *Professor of Psychology, University of California, Berkeley.*
- Raymond G. Kuhlen** (d. 1967). *Professor of Psychology, Syracuse University, N.Y.*
- Karen Landahl.** *Associate Professor of Linguistics, University of Chicago.*
- Olof Larsell** (d. 1964). *Professor of Neuroanatomy, University of Minnesota, Minneapolis.*
- Gabriel W. Lasker.** *Emeritus Professor of Anatomy, School of Medicine, Wayne State University, Detroit.*
- Richard Last.** *Television critic, Daily Telegraph (London).*
- James P. Leake, M.D.** (d. 1973). *Medical Director, U.S. Public Health Service, Washington, D.C., 1935-45.*
- Mary Leakey** (d. 1996). *Director of Research, Olduvai Gorge, Tanzania.*
- W.R. Lee, M.D.** *Professor of Occupational Health, Victoria University of Manchester, Eng.*

Benedict Leerburger. *Freelance science writer.*

Edwin Herman Lennette, M.D. *Emeritus Chief, Viral and Rickettsial Disease Laboratory, California State Department of Public Health. Lecturer in Epidemiology and Virology, University of California, Berkeley, 1948–78.*

David Le Vay. *Former Consultant Surgeon, National Health Service, United Kingdom.*

Max Levin, M.D. (d. 1974). *Neurologist and psychiatrist. Clinical Professor of Neurology, New York Medical College, New York City.*

Dorothy C.H. Ley, M.D. *Director, Palliative Care Foundation, Toronto. Former Director, Laboratory Certification and Proficiency Testing Program, Ontario Medical Association.*

Allan L. Lorincz, M.D. *Professor of Dermatology, University of Chicago.*

Douglas McAlpine, M.D. (d. 1981). *Consulting Physician, Middlesex Hospital and Maida Vale Hospital, London.*

Morton McCutcheon, M.D. (d. 1962). *Professor of Pathology, University of Pennsylvania, Philadelphia.*

William J. McGuire. *Professor of Psychology, Yale University.*

Ralph Hermon Major, M.D. (d. 1970). *Professor of Medicine and of the History of Medicine, University of Kansas, Kansas City.*

Judd Marmor, M.D. *Franz Alexander Professor Emeritus of Psychiatry, University of Southern California, Los Angeles.*

Jonathan Meader. *Freelance writer on entertainment.*

Harold Merskey, M.D. *Professor of Psychiatry, University of Western Ontario, London.*

Heino F.L. Meyer-Bahlburg. *Associate Clinical Professor of Medical Psychology, Columbia University.*

William James Mills, Jr., M.D. *Orthopedic Surgeon. Professor and Director, Center of High Latitude Health Research, University of Alaska, Anchorage. Rear Admiral (retired), Medical Corps, U.S. Naval Reserve.*

John Edgar Morison, M.D. *Honorary Professor of Histopathology, Queen's University of Belfast, N.Ire. Consultant in Histopathology, Belfast City Hospital.*

John Douglas Newth. *Former Honorary Secretary, British Council for Doctor Schweitzer's Hospital.*

Charles R. Noback. *Emeritus Professor of Anatomy and Cell Biology, College of Physicians and Surgeons, Columbia University.*

Norman H. Olsen, D.D.S. *Dean, Dental School, Northwestern University, Chicago.*

Charles Donald O'Malley (d. 1970). *Professor of Medical History, University of California Medical Center, Los Angeles.*

Martin T. Orne, M.D. *Professor of Psychiatry, University of Pennsylvania, Philadelphia; Director, Unit for Experimental Psychiatry, Institute of Pennsylvania Hospital.*

Thomas Parran, M.D. (d. 1968). *Surgeon General, U.S. Public Health Service, 1936–48. Dean, Graduate School of Public Health, University of Pittsburgh, 1948–58.*

Donald G. Paterson (d. 1961). *Professor of Psychology; Member of Staff, Industrial Relations Center, University of Minnesota, Minneapolis.*

Sir George (White) Pickering, M.D. (d. 1980). *Master of Pembroke College, Oxford, 1968–74; Regius Professor of Medicine, University of Oxford, 1956–68.*

Fred Plum, M.D. *Anne Parrish Titzell Professor of Neurology, Medical College, Cornell University, New York City. Neurologist in Chief, New York Hospital.*

C. Stanford Read, M.D. *Former Lecturer in Psychological Medicine, Bethlem Royal Hospital, London. Former Clinical Psychologist, West End Hospital for Nervous Diseases, London.*

Robert G. Richardson. *Consultant medical editor. Former Editor, Abbotempo (international medical journal).*

J. Alfred Rider, M.D. *Director, Gastrointestinal Research Laboratory, Franklin Hospital, San Francisco.*

Walther Riese, M.D. (d. 1976). *Associate Professor of the History of Medicine and of Neurology and Psychiatry, Medical College of Virginia, Richmond, 1958–60.*

Austin Herbert Riesen. *Emeritus Professor of Psychology, University of California, Riverside.*

H. Locke Robertson, M.D. *Principal and Vice-Chancellor, McGill University, Montreal, 1962–70.*

Arthur Robinson, M.D. *Professor of Biochemistry, Biophysics, and Genetics and of Pediatrics, University of Colorado, Denver.*

Nicholas A. Romas, M.D. *Director of Urology, St. Luke's-Roosevelt Hospital Center, New York City.*

Arturo Stearns Rosenblueth, M.D. (d. 1970). *Director, Centre for Investigation and Advanced Studies, National Polytechnic Institute, Mexico City.*

Paul Farr Russell, M.D. (d. 1983). *Visiting Professor, Harvard University School of Public Health, 1960–63. Staff member, Rockefeller Foundation, 1923–59.*

Heinrich Satter. *Freelance writer. Author of Paul Ehrlich, Begründer der Chemotherapie and others.*

T.C. Schneirla (d. 1968). *Curator of Animal Behaviour, American Museum of Natural History, New York City, 1947–68.*

Sidney Schulman, M.D. *Ellen C. Manning Professor of Neurology, University of Chicago.*

Laurance F. Shaffer (d. 1976). *Professor of Psychology and Education, Teachers College, Columbia University.*

Leon Sokoloff, M.D. *Emeritus Professor of Pathology, State University of New York at Stony Brook.*

Walter Graham Spector (d. 1982). *Professor of Pathology, St. Bartholomew's Hospital Medical College, University of London, 1962–82.*

William Spector. *Senior Editor, Human Life, Encyclopædia Britannica, Chicago, 1967–72. Editor of Handbook of Biological Data and others.*

Wesley William Spink, M.D. (d. 1988). *Regents' Professor of Medicine, University of Minnesota, Minneapolis, 1967–73.*

Howard Burnham Sprague, M.D. (d. 1970). *Honorary Physician to the Massachusetts General Hospital. Lecturer in Medicine, Harvard University, 1956–59.*

Ross Stagner. *Emeritus Professor of Psychology, Wayne State University, Detroit.*

Mario Stefanini, M.D. *Director of the Laboratories, St. Elizabeth's Hospital, Danville, Ill.*

Robert Henry Thouless (d. 1984). *Reader in Educational Psychology, University of Cambridge, 1945–61; Fellow of Corpus Christi College, Cambridge.*

Betty Tomasi. *Freelance writer on medical topics.*

Richard Tuttle. *Researcher, Trudeau Institute, Saranac Lake, N.Y.*

Leroy Vail. *Freelance writer.*

Ilza Veith. *Emeritus Professor of Psychiatry and the History of Health Sciences, University of California, San Francisco.*

Reino Virtanen (d. 1987). *Professor of Modern Languages, University of Nebraska, Lincoln, 1957–78.*

Nancy Theilgaard Watts. *Professor and Director, Graduate Program in Physical Therapy, MGH Institute of Health Professions, Boston.*

Louis Weinstein, M.D. *Professor of Medicine, Tufts University, Medford, Mass., 1957–75.*

Michael M. Wertheimer. *Professor of Psychology, University of Colorado, Boulder.*

Emil Witschi (d. 1971). *Senior Scientist, Bio-Medical Division of the Population Council, Rockefeller University, New York City, 1967–71.*

Henry D. von Witzleben, M.D. *Emeritus Director of Professional Education, Veterans Administration Hospital, Palo Alto, Calif. Associate Clinical Professor Emeritus of Psychiatry, Stanford University, Calif.*

Robert E. Wood, M.D. *Associate Professor of Pediatrics, University of North Carolina at Chapel Hill.*

John H. Wykert. *Medical and psychiatric writer.*

Robert Henry Yager, V.M.D. *Former Executive Secretary, Institute on Laboratory Animal Resources, National Research Council, National Academy of Sciences, Washington, D.C.*

Leo M. Zimmerman, M.D. (d. 1980). *Professor of Surgery, Chicago Medical School, 1948–80. Senior Attending Surgeon, Michael Reese Hospital, Chicago.*

Imre Zoltán, M.D. *Former Professor of Gynecology and Obstetrics, Semmelweis Medical University, Budapest.*

Part Five. Human Society

John C. Abbott. *Deputy Director, Economic Analysis Division, Food and Agriculture Organization of the United Nations, Rome.*

George Plimpton Adams, Jr. *Emeritus Professor of Economics, Cornell University, Ithaca, N.Y.*

John H. Adler (d. 1980). *Director, Programming and Budgeting Department, International Bank for Reconstruction and Development, Washington, D.C., 1968–76.*

Joseph C. Agrella. *Correspondent, The Blood-Horse magazine.*

Leslie Ronald Aldous. *Head of Information Department, United Nations Association of Great Britain and Northern Ireland, 1947–66; former Editor, United Nations Association Yearbook and New World.*

Maurice Allais. *Professor of Economic Analysis, National College of Mines of Paris. Professor of Monetary Analysis, University of Paris X, 1970–85. Nobel Prize for Economics, 1988.*

Francis A. Allen. *Huber C. Hurst Professor Emeritus of Law, University of Florida, Gainesville. Edson R. Sunderland Professor Emeritus of Law, University of Michigan, Ann Arbor.*

Rex Alston (d. 1994). *Broadcaster and journalist. Staff Sports Commentator and Reporter, British Broadcasting Corporation, 1942–61. Cricket Reporter, Daily and Sunday Telegraph (London), 1961–88.*

John Thomas Amber. *Emeritus Editor in Chief, D.B.I. Books, Inc., Northfield, Illinois; editor of Gun Digest, Handloader's Digest, Single Shot Actions and Rifles, and others.*

Robert T. Anderson. *Professor of Anthropology, Mills College, Oakland, Calif.*

Jack Andresen. *Consulting engineer. Underwater photographer. World Champion Trick Water Skier, 1950.*

Pierre Robert Angel. *Emeritus Professor of Classical and Modern Languages, Literature and Civilizations, University of Tours, Fr.*

John Armitage (d. 1980). *London Editor, Encyclopædia Britannica, 1949–65. President, Rugby Fives Association, London, 1955–60.*

Michael Austin. *Rugby and cricket writer, Daily Telegraph (London).*

Robert Auty (d. 1978). *Professor of Comparative Slavonic Philology, University of Oxford, 1965–78.*

Paul Avrich. *Distinguished Professor of History, Queens College, City University of New York, Flushing.*

Hans Herman Baerwald. *Emeritus Professor of Political Science, University of California, Los Angeles.*

B. Devereux Barker III. *Associate, Brewer & Lord (insurance), Boston. Former Associate Editor, Yachting magazine.*

Victor Barna (d. 1972). *World table tennis champion, men's singles, 1930, 1932–35; men's doubles, 1929–35; mixed doubles, 1932, 1935. Author of Tennis Today.*

Harry Elmer Barnes (d. 1968). *Historian, sociologist, and writer. Author of A History of Historical Writing and others.*

Samuel H. Baron. *Emeritus Professor of History, University of North Carolina at Chapel Hill.*

Howard Bass. *Winter sports correspondent, Daily Telegraph and Sunday Telegraph (London). Sports broadcaster, British Broadcasting Corporation World Service.*

Richard Reeve Baxter (d. 1980). *Judge, International Court of Justice, The Hague, 1979–80. Professor of Law, Harvard University, 1959–80.*

Lowell John Bean. *Emeritus Professor of Anthropology, California State University, Hayward.*

Charles-Louis de Beaumont (d. 1972). *President, Amateur Fencing Association of Great Britain. President, British Commonwealth Fencing Federation. Deputy Chairman, British Olympic Association.*

John Matthew Beck. *Executive Director, Chicago Consortium of Colleges and Universities.*

Cyril S(hirley) Belshaw. *Emeritus Professor of Anthropology, University of British Columbia, Vancouver.*

Ernest Bender. *Professor of Indo-Aryan Languages and Literatures, University of Pennsylvania, Philadelphia. General Editor, Journal of the American Oriental Society.*

George C.S. Benson. *Emeritus President, Claremont McKenna College, Calif.*

Ellen M. Bentsen. *Director for Development Communications, Northwestern University. Former Assistant Director for One Design Racing, U.S. Yacht Racing Union, Evanston, Ill.; former Editor, USYRU News.*

Louis Stanley Berenson. *Owner and Chairman of the Board, Berensons' Hartford Jai-Alai, Conn.*

Stanley F. Bergstein. *Executive Vice President, Harness Tracks of America, Morristown, N.J. Vice President, Publicity—Public Relations, U.S. Trotting Association, and Executive Editor, Hoof Beats magazine, 1968–75.*

Ronald M. Berndt (d. 1990). *Foundation Professor of Anthropology, University of Western Australia, Nedlands, 1963–81.*

Siegfried F. Bethke. *Marketing Economist, World Food Programme, Rome, 1968–78.*

David Bidney (d. 1987). *Professor of Anthropology and of Philosophy of Education, Indiana University, Bloomington, 1965–74.*

George W. Bishop, Jr. (d. 1974). *Professor and Head, Department of Finance, Northern Illinois University, De Kalb, 1965–74.*

Max Black (d. 1988). *Susan Linn Sage Professor of Philosophy, Cornell University, Ithaca, N.Y., 1946–77.*

Geoffrey Blainey. *Chancellor, University of Ballarat, Australia. Emeritus Professor of History, University of Melbourne.*

Mark Blaug. *Visiting Professor of Economics, University of Exeter, Eng. Emeritus Professor of Economics, University of Buckingham, Eng. Emeritus Professor of the Economics of Education, Institute of Education, University of London.*

Friedrich Blendinger. *Director of Archives, Augsburg, W. Ger., 1966–77.*

George Gleason Bogert (d. 1977). *James Parker Hall Professor of Law, University of Chicago.*

Marc Bouloiseau. *Former Secretary, Commission for the Economic and Social History of the French Revolution. Emeritus Teaching Assistant in the History of the French Revolution, University of Paris.*

Marjorie Boulton. *Principal, Charlotte Mason College, Ambleside, Eng., 1962–70. Member of the Esperanto Academy, Author of Zamenhof, Creator of Esperanto and others.*

Jean Bouvier (d. 1987). *Professor of Economics, University of Paris I.*

William W. Brickman (d. 1986). *Professor of Educational History and Comparative Education, University of Pennsylvania, Philadelphia, 1962–81.*

Lloyd Vernet Bridges. *Actor. Author of Masks and Flippers.*

William O(liver) Bright. *Emeritus Professor of Linguistics and Anthropology, University of California, Los Angeles.*

Colin Fraser Brockington, M.D. *Emeritus Professor of Social and Preventive Medicine, Victoria University of Manchester, Eng.*

Dorothy Margaret Brodie. *Editor of Edmund Dudley's Tree of Commonwealth.*

Martin Bronfenbrenner. *Kenan Professor Emeritus of Economics, Duke University, Durham, N.C.*

Arthur Joseph Brown. *Emeritus Professor of Economics, University of Leeds, Eng.*

Lionel Neville Brown. *Emeritus Professor of Comparative Law, University of Birmingham, Eng.*

William Francis Brown (d. 1990). *Editor, American Field, Chicago, 1943–82. Author of How to Train Hunting Dogs and others.*

James Robert Browning. *Judge, United States Court of Appeals for the Ninth Circuit, San Francisco; Chief Judge, 1976–88.*

Jean Bruhat. *Former Professor, Institute of Political Science of Paris. Former Instructor, University of Paris VIII.*

Avery Brundage (d. 1975). *President, International Olympic Committee, 1952–72.*

Anthony F. Buccini. *Research Associate, Department of Linguistics, University of Chicago.*

The Hon. Alastair Francis Buchan (d. 1976). *Montague Burton Professor of International Relations, University of Oxford, 1972–76. Founder and Director, International Institute for Strategic Studies, London, 1958–69.*

Arthur F. Burns (d. 1987). *U.S. Ambassador to the Federal Republic of Germany, 1981–85. John Bates Clark Professor of Economics, Columbia University, 1959–69. Chairman, Board of Governors, Federal Reserve System, Washington, D.C., 1970–78.*

Thomas Ferrier Burns (d. 1995). *Chairman of Burns and Oates Ltd., Publishers, London, 1948–67. Editor, The Tablet, 1967–82.*

Asa S. Bushnell (d. 1975). *Commissioner, Eastern College Athletic Conference, 1938–70.*

Robin Buss. *Writer and translator.*

R. Freeman Butts. *William F. Russell Professor Emeritus in the Foundations of Education, Teachers College, Columbia University; Associate Dean for International Studies, 1964–75.*

Raoul C. van Caenegem. *Professor of Medieval History, State University of Ghent, Belg.*

Joseph R. Caldwell. *Professor of Anthropology, University of Georgia, Athens.*

Robert Graham Caldwell. *Professor of Criminology, University of Iowa, Iowa City, 1948–72.*

Charles Clifford Callahan. *Former Professor of Law, Ohio State University, Columbus.*

Schuyler van Rensselaer Cammann. *Emeritus Professor of East Asian Studies, University of Pennsylvania, Philadelphia.*

Archibald Hunter Campbell (d. 1989). *Regius Professor of Public Law, University of Edinburgh, 1945–72.*

Guillaume Cardascia. *Emeritus Professor of the History of Ancient Private Law, University of Paris II.*

George Cardona. *Professor of Linguistics, University of Pennsylvania, Philadelphia.*

Michael Carey. *Cricket writer, Daily Telegraph (London).*

Edward H. Carr (d. 1982). *Wilson Professor of International Politics, University College of Wales, Aberystwyth, 1936–47.*

George Barr Carson, Jr. (deceased). *Professor of History, Oregon State University, Corvallis, 1961–80.*

John Philip Carter. *Emeritus Professor of Business Administration, University of California, Berkeley.*

Joseph Cataio. *Freelance writer.*

David Gawen Champernowne. *Professor of Economics and Statistics, University of Cambridge, 1969–78; Fellow of Trinity College, Cambridge.*

Brian Chapman (d. 1981). *Professor of Government, Victoria University of Manchester, 1961–81.*

Floyd Barton Chapman. *Ecologist, Metropolitan Park District, Columbus, Ohio.*

Elliott F. Cheatham (d. 1972). *Charles Evans Hughes Professor of Law, Columbia University, 1950–57. Research Professor of Law, Vanderbilt University, Nashville, Tenn., 1968–72.*

Charles Edward Clark (d. 1963). *Judge, 1939–63. Chief Judge, U.S. Court of Appeals, 2nd Circuit, 1954–59. Dean, Law School, Yale University, 1929–39.*

James D. Clarkson. *Research Associate, Center for South and Southeast Asian Studies, University of Michigan, Ann Arbor.*

Inis Lothair Claude, Jr. *Edward R. Stettinius, Jr., Professor Emeritus of Government and Foreign Affairs, University of Virginia, Charlottesville.*

Susan Clinton. *Freelance writer on public administration.*

Luella Cole (Mrs. R.H. Lowie) (deceased). *Author of History of Education, from Socrates to Montessori and others.*

Dame Margaret I. Cole (d. 1980). *Honorary President, Fabian Society, England. Author of Beatrice Webb and others.*

J(ohn) B. Condliffe (d. 1981). *Senior Economist, Stanford Research Institute, Menlo Park, Calif., 1961–67. Author of The Commerce of Nations and others.*

Bernard Earl Conor. *Corporate Vice President and President, AMF International Trade Operations, AMF, Incorporated, Stamford, Conn.*

William Stewart Cornyn (d. 1971). *Professor of Slavic and Southeast Asian Linguistics, Yale University.*

Frank A. Cowell. *Reader in Economics, London School of Economics and Political Science, University of London.*

Denis Victor Cowen. *Former Professor of Law, University of Chicago. Former Professor of Comparative Law, University of Cape Town, S.Af.*

Robert Cowen. *Senior Lecturer in Comparative Education, Institute of Education, University of London.*

Warren Cowgill (d. 1985). *Professor of Indo-European Linguistics, Yale University, 1972–85.*

Robert L. Crain. *Senior Social Scientist, Rand Corporation, at the Center for the Social Organization of Schools, Johns Hopkins University, Baltimore.*

Lawrence A. Cremin (d. 1990). *Frederick A.P. Barnard Professor of Education, Teachers College, Columbia University, 1961–90.*

Robert A. Cromie. *Host, "Book Beat," National Educational Television, 1963–79. Daily Columnist, Chicago Tribune, 1969–74.*

Brainerd Currie (d. 1965). *Professor of Law, Duke University, Durham, N.C., 1961–65.*

Stanley James Curtis (deceased). *Reader in Education, University of Leeds, Eng., 1955–58; Honorary Lecturer in Medieval Philosophy, 1934–58.*

Allison Danzig (d. 1987). *Sportswriter. The New York Times, 1923–68. Author of The History of American Football and others.*

Bernard Darwin (d. 1961). *Golf Correspondent*, *Country Life*, 1907–61, and *The Times* (London), 1919–58.

John P. Davis (d. 1973). *Editor of Special Publications*, *Phelps-Stokes Fund*, N.Y. *Editor of The American Negro Reference Book*.

Alan Charles Lynn Day. *Emeritus Professor of Economics*, *London School of Economics and Political Science*, *University of London*.

George Henry John Daysh (d. 1987). *Professor of Geography*, *University of Newcastle upon Tyne*, Eng., 1963–66.

Martin Dell (d. 1966). *Cartoonist and Puzzle Maker*, *Chicago Tribune Syndicate*.

Carl Thomas Devine. *Professor of Accounting*, *Florida State University*, *Tallahassee*, 1965–76.

Dudley Dillard (d. 1991). *Professor and Head*, *Department of Economics*, *University of Maryland*, *College Park*.

Mary Earhart Dillon. *Emerita Professor of Political Science*, *Queens College*, *City University of New York*.

William H. Dodge. *Emeritus Professor of Business*, *University of Wisconsin*, *Madison*.

Michael Hugh Donovan. *Freelance economic journalist*. *Former Editor*, *Retail Business* (monthly), *Economist Intelligence Unit*, *London*.

Joseph Dorfman (d. 1991). *Professor of Economics*, *Columbia University*, 1948–70.

Robert Dorfman. *Emeritus Professor of Economics*, *Harvard University*.

Douglas F. Dowd. *Professor of Economics*, *San Jose State University*, *Calif.* *Professorial Lecturer in International Economics*, *Johns Hopkins University School of Advanced International Studies*, *Bologna Center*, *Italy*.

Harold Edson Driver (d. 1992). *Professor of Anthropology*, *Indiana University*, *Bloomington*, 1958–73.

John W. Dudderidge. *President of Honour*, *British Canoe Union*. *Honorary Member*, *International Canoe Federation*. *Vice President*, *British Olympic Association*.

Ralph Craigon Dudrow, Jr. *Former Director for the Red Cross Centenary*, *League of Red Cross Societies*, *Geneva*.

John F. Due. *Emeritus Professor of Economics*, *University of Illinois at Urbana-Champaign*.

Allison Dunham (d. 1992). *Arnold I. Shure Professor of Urban Law*, *University of Chicago*, 1971–79.

Charles Émile Durand. *Former Professor of Constitutional Law*, *University of Aix-Marseille*, *Aix-en-Provence*, *Fr.*

Isidore Dyen. *Professor of Comparative Linguistics and Austronesian Languages*, *Yale University*, 1973–84.

John K. Dyer, Jr. *Independent Actuary*.

George Dykhuizen (d. 1987). *James Marshall Professor of Philosophy*, *University of Vermont*, *Burlington*, 1954–64.

Karl August Eckhardt. *Former Professor of Law*, *University of Berlin*.

John Percy Eddy (d. 1975). *Queen's Counsel*; *Recorder of West Ham*, 1936–49; *Stipendiary Magistrate for East and West Ham*, 1949–54.

Robert Romain Edge. *Former Associate Editor*, *Sports Afield*. *Outdoor Editor*, *American Broadcasting Company*.

Fred R. Eggan (d. 1991). *Harold H. Swift Distinguished Service Professor of Political Science*, *University of Chicago*, 1963–74.

Paul Einzig (d. 1973). *London Correspondent*, *The Commercial and Financial Chronicle* (New York), 1945–73.

Daniel Judah Elazar. *Senator N.M.* *Paterson Professor of Intergovernmental Relations*, *Bar-Ilan University*, *Ramat Gan*, *Israel*.

Adolphus Peter Elkin (d. 1979). *Professor of Anthropology*, *University of Sydney*, 1934–56.

Norman Robson Elliott. *Former Senior Lecturer in Geography*, *University of Edinburgh*.

Manuel C(onrad) Elmer (deceased). *Professor and Head*, *Department of Sociology*, *University of Pittsburgh*.

Alex Elson. *Attorney*. *Coauthor of Illinois Civil Practice Forms and others*.

Linn Emrich. *Manager*, *Skyport Airfield*, *Issaquah*, *Washington*. *Professional balloonist*, *parachutist*, and *pilot*.

Ralph Erickson. *Emeritus Professor of Physical Education*, *Loyola University*, *Chicago*.

Emory Gibbons Evans. *Professor of History*, *University of Maryland*, *College Park*.

Gordon Page Evans (d. 1991). *Secretary*, *Standing Conference on the Economic and Social Work of the United Nations*, 1952–68.

Gwynfor Evans. *Member of Parliament for Carmarthen*, *Wales*, 1966–70; 1974–79. *President*, *Plaid Cymru*, 1945–81.

Frank Fairfax. *Former Visiting Lecturer*, *Center for Afro-American and African Studies*, *University of Michigan*, *Ann Arbor*.

Charles Fairman. *Emeritus Professor of Law*, *Harvard University*.

David I. Fand. *Emeritus Professor of Economics*, *Wayne State University*, *Detroit*.

Dan Farley. *Former Managing Editor*, *The Thoroughbred Record*.

Louis C. Faron. *Emeritus Professor of Anthropology*, *State University of New York at Stony Brook*.

Clarence Henry Faust (d. 1975). *President*, *Fund for the Advancement of Education*, 1951–57; *Vice President*, *The Ford Foundation*, *New York City*, 1957–75.

David Fellman. *Vilas Professor Emeritus of Political Science*, *University of Wisconsin*, *Madison*.

Charles G. Fenwick (d. 1973). *Director*, *Department of International Law*, *Pan American Union*, *Washington, D.C.*, 1948–62. *Professor of Political Science*, *Bryn Mawr College*, *Pa.*, 1918–40.

Cornelia Van Hook Ferber. *Economist*, *Office of Programs and Research*, *Export-Import Bank of the United States*.

John Henry Webb Fingleton (d. 1981). *Journalist*. *International Cricketer*, 1931–38. *Author of Cricket Crisis and others*.

Lawrence E. Fisher. *Former Director of Graduate Studies*, *Department of Anthropology*, *Loyola University*, *Chicago*.

Ossip K. Flechtheim. *Emeritus Professor of Political Science*, *Free University*, *Berlin*.

Henry Hubbard Foster, Jr. (d. 1988). *Professor of Law*, *New York University*, *New York City*, 1962–77.

Robert Allen Fowkes. *Emeritus Professor of Germanic Languages*, *New York University*, *New York City*.

Henry Waller Fowler, Jr. *Securities trader*. *Author of Kites and others*.

Michel François (d. 1981). *Professor of the History of French Institutions*, *École Nationale des Chartes*, *Paris*.

Phyllis Frederick. *Toy and game designer*, *Mattel Inc.*, *Hawthorne*, *Calif.*

Richard L(incoln) Frey (d. 1988). *Editor in Chief*, *Official Encyclopædia of Bridge*, 1964–76. *Editor*, *The Contract Bridge Bulletin*, 1958–70. *President*, *International Bridge Press Association*, 1970–81.

(Jerome) Ed(ison) Friel. *Former Sportswriter*, *Newark (N.J.) News*. *Former President*, *New York Track Writers Association*.

Harold T. Frierhood. *Former Chairman*, *Education Council*, *United States Olympic Committee*. *Editor of When Volleyball Began and others*.

Lon L. Fuller (d. 1978). *Carter Professor of General Jurisprudence*, *Harvard University*, 1948–72.

Joseph William Garbarino. *Emeritus Professor of Business Administration*, *University of California*, *Berkeley*.

Charles Garratt-Holden. *Former Secretary*, *The Building Societies Association*, *London*.

Paul Henry Gebhard. *Emeritus Professor of Anthropology, Indiana University, Bloomington; former Director, Institute for Sex Research.*

Ignace J. Gelb (d. 1985). *Frank P. Hixon Distinguished Service Professor, Oriental Institute and Departments of Linguistics and of Near Eastern Languages and Civilizations, University of Chicago, 1965–79.*

David George. *Journalist and freelance writer on sports.*

O. Benjamin Gerig (d. 1976). *Director, Office of Dependent Area Affairs, U.S. Department of State, 1945–62.*

Colin Gibson. *Rugby League writer, Daily Telegraph (London).*

Douglas Stuart Gilbert (d. 1979). *Sports columnist, Edmonton Sun, 1978–79. Sports reporter, Montreal Gazette, 1970–78.*

Peter Robin Gimbel (d. 1987). *Film Producer and Director, Blue Water, White Death and others.*

Alexander Hayden Girard. *Architect.*

Geoffrey R. Gleeson. *International judo consultant. Executive Officer, British Association of National Coaches. Author of Judo for the West and others.*

Oscar R. Goodman (d. 1985). *Professor of Economics and Finance, Roosevelt University, Chicago, 1966–85.*

Charles H. Goren (d. 1991). *Author and lecturer. Bridge Editor, Chicago Tribune-New York News Syndicate. Author of Contract Bridge Complete and others.*

E. Kathleen Gough Aberle (d. 1990). *Research Associate in Anthropology, University of British Columbia, Vancouver. Professor of Anthropology, Simon Fraser University, Burnaby, B.C., 1967–70.*

Frank Graner. *Former Professor of Finance, University of Wisconsin, Madison.*

Leo Gross (d. 1990). *Professor of International Law, Tufts University, Medford, Mass., 1943–80.*

David Lawrence Grove. *Vice President and Chief Economist, International Business Machines Corp., Armonk, N.Y., 1969–78.*

Seli Groves. *Freelance writer.*

Claude William Guillebaud (d. 1971). *Lecturer in Economics, University of Cambridge, 1926–56.*

Lealand Roger Gustavson (d. 1966). *Artist and illustrator. Author of Winning Badminton and others.*

Harry G. Guthmann (d. 1981). *Morrison Professor of Finance, Northwestern University, Evanston, Ill., 1949–65.*

Gottfried Haberler (d. 1995). *Professor of International Trade, Harvard University, 1936–71.*

Green H. Hackworth (d. 1973). *Judge, International Court of Justice, The Hague, 1946–61.*

Eric P. Hamp. *Robert Maynard Hutchins Distinguished Service Professor Emeritus of Linguistics, of Psychology, and of Slavic Languages, University of Chicago.*

Moffatt Hancock. *Former Kirkwood Professor of Law, Stanford University, Calif.*

Frank Hamilton Hankins (d. 1970). *Professor of Sociology, Smith College, Northampton, Mass., 1922–46.*

Jerry F. Hardy. *Coordinator for Gymnastics, Amateur Athletic Union of the United States. Member, Board of Directors, U.S. Gymnastics Federation. Member, U.S. Men's Olympic Gymnastic Committee, 1940; 1952–72.*

Fred Harvey Harrington (d. 1995). *Vilas Research Professor of American Diplomatic History, University of Wisconsin, Madison, 1970–82; President of the University of Wisconsin, 1962–70.*

Herbert Lionel Adolphus Hart (d. 1992). *Principal of Brasenose College, Oxford, 1973–78; Professor of Jurisprudence, University of Oxford, 1952–68.*

Joseph R. Hartley. *Professor of Business Administration, Indiana University, Bloomington.*

Nancy Kymn Harvin. *Freelance writer.*

Harlan Henthorne Hatcher. *President Emeritus, University of Michigan, Ann Arbor.*

Robert J. Havighurst (d. 1991). *Professor of Education and of Human Development, University of Chicago, 1941–65.*

Robert D. Herman. *Professor of Sociology, Pomona College, Claremont, Calif.*

D. Alan Heslop. *Director, Rose Institute of State and Local Government, Claremont McKenna College, Calif.*

Forest Garrett Hill. *Professor of Economics, University of Texas at Austin.*

J. E. Christopher Hill. *Master, Balliol College, University of Oxford, 1965–78.*

Norman Llewellyn Hill (d. 1976). *Professor of International Law and Relations, University of Nebraska, Lincoln, 1935–63.*

Finn Hiorthøy. *Judge of the Supreme Court of Norway, Oslo, 1955–73.*

Frank Hole. *Professor and Chairman, Department of Anthropology, Yale University.*

(George) Kenneth Holland (d. 1977). *President, Institute of International Education, Inc., New York City, 1950–73.*

J. Edgar Hoover (d. 1972). *Director, Federal Bureau of Investigation, U.S. Department of Justice, Washington, D.C., 1924–72.*

Bert Frank Hoselitz. *Emeritus Professor of the Social Sciences and Economics, University of Chicago.*

Cyril O. Houle. *Emeritus Professor of Education, University of Chicago.*

Ralph Gordon Hoxie. *President, Center for the Study of the Presidency, New York City. Chancellor, Long Island University, Greenvale, N.Y., 1964–68.*

Edward M. Hutchinson (d. 1994). *Educational consultant. Secretary, National Institute of Adult Education, London, 1947–71; Editor, Adult Education journal, 1949–71.*

Ford Hutchinson. *Freelance writer.*

Terence Wilmot Hutchison. *Emeritus Professor of Economics, University of Birmingham, Eng.*

John Henry Hutton (d. 1968). *William Wyse Professor of Social Anthropology, University of Cambridge, 1937–50.*

James Nevins Hyde (d. 1996). *Lawyer. Adviser, Interim Committee, United States Mission, United Nations, New York City, 1948–53.*

Jozef A.M.K. IJsewijn. *Professor of Neo-Latin, Catholic University of Louvain, Belg.*

Jacques André Istel. *President, Parachutes Incorporated, Orange, Mass., 1957–87. Captain, U.S. parachuting team, 1956 and 1958.*

Elmore Jackson (d. 1989). *Vice President, United Nations Association of the U.S.A., 1966–73. Special Assistant for Policy Planning to the Assistant Secretary of State for International Organization Affairs, U.S. Department of State, 1961–64.*

William Turrentine Jackson. *Emeritus Professor of American History, University of California, Davis.*

Per Jacobsson (d. 1963). *Managing Director, International Monetary Fund, Washington, D.C., 1956–63.*

Oswald Jacoby (d. 1984). *Author of Oswald Jacoby's Complete Canasta and many other works on card playing.*

Fred W. Jameson (deceased). *Manager of Educational Services, Public Relations Department, Montgomery Ward and Company, Chicago.*

Philip C. Jessup (d. 1986). *Judge, International Court of Justice, The Hague, 1961–70.*

John E. Jeuck. *Robert Law Professor Emeritus of Business Administration, University of Chicago.*

Gareth H. Jones. *Downing Professor of the Laws of England, University of Cambridge; Fellow of Trinity College, Cambridge.*

Bernard Joy. *Former football correspondent, Evening Standard, London. Author of Soccer Tactics.*

Milton Z. Kafoglis. *Professor of Economics, Emory University, Atlanta, Ga.*

Jerome Kagan. *Professor of Psychology, Harvard University.*

Nicholas deBelleville Katzenbach. *Chairman, First American Bankshares, Inc., Washington, D.C., Vice President and General Counsel, International Business Machines Corporation, Armonk, N.Y., 1969–84. Attorney General, U.S. Department of Justice, 1965–66. Under Secretary, U.S. Department of State, 1966–68.*

Terrence Kaufman. *Professor of Anthropology and Linguistics, University of Pittsburgh.*

Michael Kazin. *Associate Professor of History, American University, Washington, D.C.*

Frank E. Keating (d. 1995). *Fishing Editor, Newsday, Garden City, N.Y., 1977–80.*

George Williams Keeton (d. 1989). *President, London Institute of World Affairs, 1952–89. Professor of English Law, University of London, 1937–69.*

William H. Kelly (d. 1980). *Professor of Anthropology, University of Arizona, Tucson, 1952–74.*

Howard H. Kendler. *Emeritus Professor of Psychology, University of California, Santa Barbara.*

Raymond P. Kent (d. 1983). *Professor of Finance and Business Economics, University of Notre Dame, Ind.*

Marshall D. Ketchum (d. 1989). *Professor of Finance, University of Chicago, 1951–71.*

V.O. Key, Jr. (d. 1963). *Jonathan Trumbull Professor of American History and Government, Harvard University, 1955–63.*

Frank Leroy Kidner. *Vice President of Educational Relations; Professor of Economics, University of California, Berkeley.*

Carol D. Kiesinger. *Arts consultant. Hiker and mountain climber. Coeditor of The Armchair Mountaineer.*

Joseph C. Kiger. *Director, Program on Foundations and Comparable Organizations, University of Mississippi, University.*

Charles P. Kindleberger. *Emeritus Professor of Economics, Massachusetts Institute of Technology, Cambridge.*

Vernon Kinietz. *Educator. Author of Chippewa Village and others.*

Clyde Vernon Kiser. *Former Senior Research Demographer, Office of Population Research, Princeton, N.J.*

Lawrence R. Klein. *Benjamin Franklin Professor of Economics, University of Pennsylvania, Philadelphia. Nobel Prize for Economics, 1980.*

Paul Lincoln Kleinsorge. *Emeritus Professor of Economics, University of Oregon, Eugene.*

Paul E. Klopsteg (d. 1991). *Professor of Applied Science, Northwestern University, Evanston, Ill., 1944–54.*

George Frederick Kneller. *Emeritus Professor of Education, University of California, Los Angeles.*

Ole Ferdinand Knudsen. *Editor, Export Council of Norway, Oslo.*

Herman Kogan (d. 1989). *Journalist. Corporate Historian, Field Enterprises, Inc., 1977–89. Author of The Great EB.*

Omari Kokole. *Associate Director, Institute of Global Cultural Studies, State University of New York at Binghamton.*

Walter Korn. *Author of The Brilliant Touch in Chess; Modern Chess Openings; and others.*

John Richard Krueger. *Managing Editor, publications of the Mongolia Society, Indiana University, Bloomington; former Professor of Uralic and Altaic Studies.*

Philip B. Kurland (d. 1996). *William R. Kenan, Jr., Distinguished Service Professor of Law, University of Chicago, 1976–92. Editor, The Supreme Court Review, 1960–89.*

Peter N. Ladefoged. *Emeritus Professor of Phonetics, University of California, Los Angeles.*

Harry Wellington Laidler (d. 1970). *Executive Director, League for Industrial Democracy.*

Clay Lancaster. *Author of Japanese Influence in America; Architectural Follies in America; and others.*

Gerard Eduard Langemeijer. *Attorney General, Supreme Court of the Netherlands, The Hague, 1957–73.*

Luce-Andrée Langevin. *Honorary Professor; former teacher of physical science, Lycée Fénélon, Paris. Author of Lomonossov.*

George E. Lardner (deceased). *Associate Editor, Bell-McClure Syndicate, Inc., New York City.*

Richard C. Latham. *Partner, Seay & Latham Investments, Dallas, Texas. Coauthor of United States Polo Association Annual.*

Gilbert P. Laue. *Former Chief Copy Editor, Richard D. Irwin, Inc., Homewood, Ill. Former Associate Editor, Sports, Encyclopædia Britannica, Chicago.*

Elihu Lauterpacht. *Barrister-at-Law. Fellow of Trinity College, Cambridge; Reader in International Law, University of Cambridge.*

Sir Edmund Ronald Leach (d. 1989). *Provost of King's College, Cambridge, 1966–79; Professor of Social Anthropology, University of Cambridge, 1972–78.*

James Elzar Lebensohn, M.D. *Associate Professor Emeritus of Ophthalmology, Northwestern University, Chicago.*

Colin Legum. *Associate Editor, The Observer, London, 1949–82. Editor, Africa Contemporary Record, 1968–83.*

Richard M. Leighton. *Military historian and consultant. Professor of National Security Affairs, National Defense University, U.S. Department of Defense, Washington, D.C., 1965–78.*

George Eidt Lent. *Assistant Director, Tax Policy Division, International Monetary Fund, Washington, D.C., 1964–75.*

Don Divance Lescohier (d. 1961). *Professor of Economics, University of Wisconsin, Madison, 1918–61.*

Robert Alan LeVine. *Roy E. Larsen Professor of Education and Human Development, Harvard University.*

Solomon B. Levine. *Emeritus Professor of Business and Economics, University of Wisconsin, Madison.*

David L. Lewis. *Martin Luther King, Jr. University Professor of History, Rutgers University, New Brunswick, N.J.*

Choh-Ming Li (d. 1991). *Professor of Business Administration, University of California, Berkeley, 1958–64. Vice-Chancellor, Chinese University of Hong Kong, 1964–78.*

Fang Kuei Li (d. 1987). *Professor of Chinese Linguistics and Anthropology, University of Washington, Seattle, 1959–69. Professor of Asian Linguistics, University of Hawaii, Honolulu, 1969–73.*

Alfred Lief. *Biographer and business historian.*

Joseph Colville Lincoln. *Author of Soaring for Diamonds.*

Genevieve Collins Linebarger. *Associate Professor of Political Science, Trinity College, Washington, D.C., 1967–68.*

Paul M.A. Linebarger (d. 1966). *Professor of Asiatic Politics, School of Advanced International Studies, Johns Hopkins University, Washington, D.C., 1946–66.*

Kwang-Ching Liu. *Professor of History, University of California, Davis.*

Karl Nickerson Llewellyn (d. 1962). *Professor of Law, University of Chicago, 1951–62.*

Laurence Lockhart (d. 1975). *Member of the Faculty of Oriental Studies, University of Cambridge.*

Erwin Hugo Loewenfeld (deceased). *Solicitor of the Supreme Court, Great Britain. Member of the Faculty of Law, University of Cambridge. Legal Adviser, Liechtenstein Government.*

James Rubert Longstreet. *Professor of Finance, University of South Florida, Tampa.*

Jo Desha Lucas. *Arnold I. Shure Professor Emeritus of Law, University of Chicago.*

Alma Lutz (d. 1973). *Author of Susan B. Anthony, Rebel, Crusader, Humanitarian and others.*

John P. Lyall. *Marine Information Specialist and Sailing Directions Writer, Sailing Directions Branch, U.S. Naval Oceanographic Office, Washington, D.C.*

Sir John Lyons. *Master of Trinity Hall, University of Cambridge. Professor of Linguistics, University of Sussex, Brighton, Eng., 1976–84.*

John Dennis McCallum (d. 1988). *Author of That Kelly Family; The Tiger Wore Spikes; Big Eight Football; and others.*

Wendell McClean. *Research Assistant, Institute of Social and Economic Research, University of the West Indies, Kingston, Jamaica.*

John McDowell (d. 1974). *Director for Social Welfare, National Council of the Churches of Christ in the U.S.A., 1967–73.*

Joseph E. McGrath. *Professor of Psychology, University of Illinois, Urbana.*

James Angell MacLachlan (d. 1967). *Professor of Law, Harvard University, 1927–60.*

Charles R. McLoud. *Head, Sailing Directions Branch, U.S. Naval Oceanographic Office, Washington, D.C.*

(Ardee) Wayne McMillen. *General Consultant, Bay Area Social Planning Council, Oakland, Calif. Professor of Social Service Administration, University of Chicago, 1936–60.*

Arnold Duncan McNair, 1st Baron McNair (d. 1975). *President, International Court of Justice, 1952–55; Judge, 1946–55.*

Edward McWhinney. *Queen's Counsel. Emeritus Professor of Constitutional and International Law, Simon Fraser University, Burnaby, B.C.*

Norris Dewar McWhirter. *Television commentator, Olympic Games, British Broadcasting Corporation, 1960–72. Compiler, Guinness Book of World Records; Dunlop Book of Facts.*

Philip Maher. *Freelance writer.*

Janice Grow Maienza. *Freelance writer.*

Reginald Francis Malcolmson (d. 1992). *Professor of Architecture, 1964–83; Dean, College of Architecture and Urban Planning, University of Michigan, Ann Arbor, 1964–74.*

Martin E. Malia. *Emeritus Professor of History, University of California, Berkeley.*

Yakov Malkiel. *Professor of Linguistics and Romance Philology, University of California, Berkeley.*

Sir James Gow Mann (d. 1962). *Surveyor of the Queen's Works of Art, 1946–62. Master of the Armouries, The Tower of London, 1939–62.*

Benigno Mantilla Pineda. *Professor of the Sociology and Philosophy of Law, University of Antioquia, Medellín, Colom.*

Julius Margolis. *Professor of Economics, University of California, Irvine.*

McKim Marriott. *Professor of Anthropology, University of Chicago.*

John C. Martin. *Director, Navigational Information Services Division, U.S. Naval Oceanographic Office, Washington, D.C.*

Roscoe C. Martin (d. 1972). *Professor of Political Science, Syracuse University, N.Y., 1949–72.*

Erich Matthias (d. 1983). *Professor of Contemporary History and Political Science, University of Mannheim, W.Ger.*

Wilhelm Matull (deceased). *Senior Civil Servant, National Centres for Political Education, Hannover, Bonn, and Düsseldorf, W.Ger., 1954–68.*

Harold M. Mayer (d. 1994). *Professor of Geography, University of Wisconsin, Milwaukee, 1974–94.*

John F. Mee (d. 1985). *Mead Johnson Professor of Management, Indiana University, Bloomington.*

Ben Scudder Meeker. *Chief U.S. Probation Officer and Director of Training Center, Chicago.*

Patrick Denis Mehigan (deceased). *Author of History of Hurling; History of Irish Athletics; and others.*

Lois Bannister Merk. *Lecturer in History, Northeastern University, Boston, 1956–68.*

Ford Messamore (d. 1962). *Professor of Stockton College, Canton, Mo.*

Michael Charles Meston. *Professor of Scots Law, University of Aberdeen, Scot.*

Adolphe Erich Meyer (d. 1988). *Professor of Educational History, New York University, New York City, 1946–63.*

Karl W. Meyer. *Chancellor, University of Wisconsin, Superior.*

Karl B. Michael. *Emeritus Swimming Coach, Dartmouth College, Hanover, N.H. U.S. Olympic Team Men's Diving Coach, 1956.*

John F.M. Middleton. *Emeritus Professor of Anthropology and Religious Studies, Yale University.*

Elmer Mayse Million (d. 1990). *Professor of Law, University of Oklahoma, Norman, 1970–83.*

Aron Leonard Minkes. *Professor of Business Organization, University of Birmingham, Eng.*

Broadus Mitchell (d. 1988). *Professor of Economics, Rutgers University, New Brunswick, N.J., 1949–58.*

Laura Molzahn. *Freelance writer.*

Ashley Montagu. *Biological and cultural anthropologist. Professor and Chairman, Department of Anthropology, Rutgers University, New Brunswick, N.J., 1949–55.*

Patrick Wykeham Montague-Smith. *Consulting Editor, Debrett's Peerage; Editor, 1962–80.*

John Michael Montias. *Professor of Economics, Yale University.*

Lynn Montross (d. 1961). *Historian, United States Marine Corps, 1950–61.*

The Rev. E. Garth Moore (d. 1990). *Barrister-at-Law. Chancellor, Dioceses of Durham, 1954–89, Southwark, 1948–90, and Gloucester, 1957–90. Fellow of Corpus Christi College, University of Cambridge, 1947–90.*

Albert H. Morehead (d. 1966). *Writer and editor. Bridge Editor, The New York Times, 1935–63.*

Hans J. Morgenthau (d. 1980). *Albert A. Michelson Distinguished Service Professor of Political Science and Modern History, University of Chicago, 1963–68. Leonard Davis Distinguished Professor of Political Science, City College, City University of New York, 1968–74.*

Cyril John Morley. *Former Honorary Secretary, British Falconers' Club and International Association of Falconry and Conservation of Birds of Prey.*

James William Morley. *Professor of Government, Columbia University.*

Geoffrey Mott-Smith (d. 1960). *Editor, The Bridge World, 1936–46; Games Digest, 1938–39, Author of Book of Hobbies and others.*

Nicos Panayiotou Mouzelis. *Senior Lecturer in Sociology, London School of Economics and Political Science, University of London.*

George Peter Murdock (d. 1985). *Andrew Mellon Professor of Social Anthropology, University of Pittsburgh, 1960–73.*

Lawrence Nabers. *Professor of Economics, University of Utah, Salt Lake City.*

Manning Nash. *Emeritus Professor of Anthropology, University of Chicago.*

Phil Caldwell Neal. *Harry A. Bigelow Professor Emeritus of Law, University of Chicago.*

Carl Leroy Nelson. *George O. May Professor of Financial Accounting, Columbia University.*

Jeannette Paddock Nichols. *Historian, University of Pennsylvania, Philadelphia, 1969–78; Associate Professor of History, 1957–61.*

Maurice Nockles. *Press and Information Officer, Board of Customs and Excise, London.*

Val Nolan, Jr. *Emeritus Professor of Law and of Biology, Indiana University, Bloomington.*

Jan P. Norbye. *Freelance writer on automobiles. Former International Editor, Automotive News.*

Douglass Cecil North. *Professor of Economics, University of Washington, Seattle.*

Robert C. North. *Emeritus Professor of Political Science, Stanford University, Calif.*

D.P. O'Brien. *Professor of Economics, University of Durham, Eng.*

A.C. Olshen. *Actuarial consultant. Former Senior Vice President and Director, West Coast Life Insurance Company, San Francisco.*

Morris Edward Opler (d. 1996). *Professor of Anthropology, Cornell University, Ithaca, N.Y., 1948–69.*

Keith Langford Osborne. *Honorary Editor of British Rowing Almanack.*

Herbert L. Packer (d. 1972). *Professor of Law, Stanford University, Calif.*

Roland Palmedo (d. 1977). *President, Amateur Ski Club of New York. Cofounder, National Ski Patrol.*

Robert Parienté. *Former Editor in Chief, L'Équipe (daily sports newspaper), Paris.*

Ralph Halstead Parker (d. 1990). *Dean, School of Library and Information Science, University of Missouri, Columbia, 1966–74.*

Charles William Parkin (deceased). *Fellow and Lecturer of Clare College, University of Cambridge.*

Cyril Northcote Parkinson (d. 1993). *Raffles Professor of History, University of Malaya, 1950–58.*

Maureen L.P. Patterson. *Former Associate Professor of South Asian Languages and Civilizations; former South Asia Bibliographic Specialist, University of Chicago.*

Kosta Stevan Pavlowitch. *Former Librarian, Department of Slavonic Studies, University of Cambridge. Yugoslav diplomat, 1928–45.*

Andrew K. Pawley. *Professor of Linguistics, Research School of Pacific Studies, Australian National University, Canberra.*

Adamantios A. Pepelasis. *Former Professor of Economics, Virginia Polytechnic Institute and State University, Blacksburg.*

R. Scott Perry. *Freelance writer on education.*

Frederick William Pethick-Lawrence, 1st Baron Pethick-Lawrence (d. 1961). *Secretary of State for India and Burma, 1945–47. Privy Councillor.*

James L. Phillips. *Associate Professor of Archaeology; Director, Graduate Studies in Archaeology, University of Illinois, Chicago.*

Joseph Dexter Phillips. *Research Professor, Bureau of Economic and Business Research, University of Illinois, Urbana.*

Donald L. Piccard. *Balloon designer and manufacturer.*

Jean Felix Piccard (d. 1963). *Professor of Aeronautical Engineering, University of Minnesota, Minneapolis. F.A.I. Balloon Pilot.*

Jeannette Piccard (d. 1981). *Consultant to the Director, National Aeronautical and Space Administration Manned Spacecraft Center, Houston, Texas, 1964–70.*

Francis S. Pierce. *Former Editor, Congressional Budget Office, Washington, D.C. Associate Editor, Economics, Encyclopædia Britannica, Chicago, 1967–73.*

George Wilson Pierson (d. 1993). *Larned Professor of History, Yale University, 1946–73.*

John Pincus. *Economic consultant. Former Manager, California Program, Rand Corporation, Santa Monica.*

William M. Pinkerton. *Former News Officer for the University, Harvard University.*

Frederick P. Pittera. *Chairman, International Exposition Consultants Co. President, Frederick Pittera and Associates, Inc. Author of The Art and Science of International Fairs and Exhibitions and others.*

Cecil Wilson Plant. *Honorary Secretary, International Water Polo Board.*

Earl Edward Pollock. *Member of the law firm of Sonnenschein, Carlin, Nath & Rosenthal, Chicago.*

David Morris Potter (d. 1971). *William R. Coe Professor of American History, Stanford University, Calif., 1961–71.*

Pitman Benjamin Potter (d. 1981). *Grozier Professor of International Law, American University, Washington, D.C., 1944–57.*

Raphael Powell (d. 1965). *Professor of Roman Law, University of London, 1955–64.*

Arnold H. Price. *Historian. Former Area Specialist for Central Europe, Library of Congress, Washington, D.C.*

Francis Douglas Price. *Former Lecturer in Modern History, University of Oxford.*

Jack H. Prost. *Associate Professor of Physical Anthropology, University of Illinois, Chicago.*

Roy Pryce. *Visiting Professor, European Institute of Public Administration, Maastricht, Neth. Director, Directorate General for Information, Commission of the European Communities, Brussels, 1973–78.*

Jean Puhvel. *Emeritus Professor of Classics and Indo-European Studies, University of California, Los Angeles.*

Ernst Pulgram. *Hayward Keniston Distinguished Professor Emeritus of Romance and Classical Linguistics, University of Michigan, Ann Arbor.*

Peter George Julius Pulzer. *Gladstone Professor of Government and Public Administration, University of Oxford.*

Nathan Marsh Pusey. *President of Harvard University, 1953–71.*

Robert Mantle Rattenbury (d. 1970). *Registrar, University of Cambridge, 1953–69.*

Helen B. Redl. *Professor of Early Child Education, North Adams State College, Mass.*

Jerry Reedy. *Freelance writer.*

David Allen Revzan. *Emeritus Professor of Marketing, University of California, Berkeley.*

Max Rheinstein (d. 1977). *Max Pam Professor of Comparative Law, University of Chicago, 1942–68.*

Madeleine Hooke Rice. *Emeritus Professor of History, Hunter College, City University of New York.*

Ivor Armstrong Richards (d. 1979). *Professor of English, Harvard University, 1944–63.*

John Henry Richardson (d. 1970). *United Nations Technical Assistance Adviser (International Labour Office), 1956–65. President, Aden Industrial Court, 1960–66. Professor of Industrial Relations, University of Leeds, Eng., 1930–55.*

Jack L. Roach. *Professor of Sociology, University of Connecticut, Storrs.*

Janet K. Roach. *Instructor in Sociology, Eastern Connecticut State College, Willimantic.*

Allen Roberts. *Former Professor of Anthropology, University of Michigan, Ann Arbor.*

Benjamin Charles Roberts. *Emeritus Professor of Industrial Relations, London School of Economics and Political Science, University of London.*

John Morris Roberts. *Warden, Merton College, University of Oxford.*

Sir Dennis Holme Robertson (d. 1963). *Professor of Political Economy, University of Cambridge, 1944–57.*

William H.P. Robertson (deceased). *Editor-Publisher, The Thoroughbred Record; Chairman, Record Publishing Company, Inc., Lexington, Ky.*

Robert Robson (d. 1995). *Fellow of Trinity College, University of Cambridge, 1956–95. Author of The Attorney in Eighteenth Century England.*

William Alexander Robson (d. 1980). *Professor of Public Administration, University of London, 1947–62.*

C.H. Rolph (d. 1994). *Director, New Statesman, London, 1965–80; staff writer, 1947–70. Author of Law and the Common Man and others.*

Raymond de Roover (d. 1972). *Professor of History, Brooklyn College, City University of New York.*

Rabbi Samuel Rosenblatt. *Former Professor of Oriental Languages, Johns Hopkins University, Baltimore.*

Margaret Keeney Rosenheim. *Helen Ross Professor of Social Service Administration, University of Chicago.*

Elliot Rudwick (d. 1985). *Professor of Sociology and of History; Senior Research Fellow, Center for Urban Regionalism, Kent State University, Ohio.*

Raymond A. Ruge. *President, Eastern Ice Yachting Association, 1948, 1959–60; Secretary, 1938–42.*

Don Russell (d. 1986). *Freelance writer. Author of The Wild West: A History of the Wild West Shows and others.*

Alan Ryalls. *Editor, Camping and Caravanning magazine, Camping Club of Great Britain and Ireland, 1956–75. Author of Modern Camping and others.*

M.J. Ryan. *Former Professor of Constitutional Law, University College, Dublin.*

John E. Sadler. *Head, Education Department, City of Birmingham College of Education, University of Birmingham, Eng., 1950–67.*

Wolfgang Sauer. *Professor of History, University of California, Berkeley.*

Donald Sayenga. *Author of "The Oldest Sport," a series of articles on the history of wrestling, in Amateur Wrestling News.*

John Scarne (d. 1985). *President, John Scarne Games, Inc., North Bergen, N.J. Author of Scarne's Complete Guide to Gambling and others.*

Joseph B. Schechtman (d. 1970). *President, United Zionist Revisionists of America.*

Donald Schiffer (d. 1964). *Editor, Sport and Outdoor Book Division, Thos. Nelson and Sons, New York City.*

Elmer Schmierer. *Colonel, U.S. Army, Infantry (retired).*

Helmut Schoeck. *Professor of Sociology, Johannes Gutenberg University, Mainz, Ger.*

Albert Schoenfield. *Swimmer.*

G. Richard Schreiber. *President, National Automatic Merchandising Association, Chicago.*

Gerhard Schulz. *Professor of Contemporary History; Director, Seminar of Contemporary History, University of Tübingen, Ger.*

Georg Schwarzenberger (d. 1991). *Professor of International Law, University of London, 1962–75. Director, London Institute of World Affairs, 1943–71.*

Egon Schwelb (d. 1979). *Principal Officer, Office of Legal Affairs, United Nations, New York City; Deputy Director, Division of Human Rights, 1947–62. Senior Fellow and Lecturer in Law, Yale University, 1962–68.*

Austin Wakeman Scott, Jr. (d. 1966). *Professor of Law, University of Colorado, Boulder.*

Thomas A. Sebeok. *Distinguished Professor of Linguistics and Semiotics; Professor of Anthropology and of Folklore; Chairman, Research Center for Language and Semiotic Studies, Indiana University, Bloomington.*

Melvin Seeman. *Professor of Sociology, University of California, Los Angeles.*

Odell Shepard (d. 1967). *Author of Pedlar's Progress, The Life of Bronson Alcott and others.*

Kate Silber (deceased). *Senior Lecturer in German, University of Edinburgh, 1963–73.*

David L. Sills. *Executive Associate, Social Science Research Council, New York City.*

Stanley C. Silverberg. *Director of Research, Federal Deposit Insurance Corporation, Washington, D.C.*

Helen Silving. *Professor of Law, University of Puerto Rico, 1957–76.*

Edwin Howard Simmons. *Brigadier General, U.S. Marine Corps; Director, Marine Corps History and Museums, Arlington, Va.*

Denis Sinor. *Distinguished Professor Emeritus of Uralic and Altaic Studies and of History, Indiana University, Bloomington.*

Gabriel Smith. *Barrister-at-Law. Departmental Editor, Journal of Business Law.*

George Alan Smith. *Arts consultant. Hiker and mountain climber. Author of Introduction to Mountaineering.*

Jack Smith. *Senior Editor, Yachting magazine, Cos Cobb, Conn.*

Theodore H. Smith. *Emeritus Professor of Marketing, California State College, Fullerton.*

Pincus Sober (d. 1980). *Chairman, National A.A.U. Law and Legislation Committee; Track and Field Committee, 1956–61. Chairman, U.S. Olympic Track and Field Committee, 1957–61.*

Ernst Frithiof Söderlund. *Emeritus Professor of Economic History, University of Stockholm.*

Wallace Sokolsky. *Associate Professor of History, Bronx Community College, City University of New York. Lecturer, New York University and New School for Social Research, New York City.*

Ezra Solomon. *Dean Witter Professor of Finance, Graduate School of Business, Stanford University, Calif.*

Dorothy Mary Spencer. *Visiting Lecturer in South Asia Regional Studies, University of Pennsylvania, Philadelphia.*

Joseph J. Spengler (d. 1991). *James B. Duke Professor of Economics, Duke University, Durham, N.C., 1955–71.*

Edward H. Spicer (d. 1983). *Professor of Anthropology, University of Arizona, Tucson.*

Sybille van der Sprenkel. *Former Lecturer in Sociology, University of Leeds, Eng.*

Mysore Narasimhachar Srinivas. *Professor and Head, Department of Sociology, Institute for Social and Economic Change, Bangalore, India.*

W.J. Stankiewicz. *Professor of Political Science, University of British Columbia, Vancouver.*

Helmut Dietmar Starke. *Freelance writer on modern European history.*

Oscar State. *Former General Secretary, International Weightlifting Federation and Commonwealth Weightlifting Federation.*

Michael Steed. *Senior Lecturer in Government, Victoria University of Manchester.*

Erwin Stengel, M.D. (d. 1973). *Professor of Psychiatry, University of Sheffield, Eng.*

Wilson Stephens. *Former Editor, The Field, London. Coeditor of In Praise of Hunting.*

Walter Marcel Stern (d. 1996). *Senior Lecturer in Economic History, London School of Economics and Political Science, University of London.*

Henry Noel Cochrane Stevenson. *Managing Director, Scottish Television Ltd., 1961–66. Lecturer in Social Anthropology, University of Glasgow, 1950–57. Burma Frontier Service, 1926–47.*

Omer C. Stewart (d. 1991). *Professor of Anthropology, University of Colorado, Boulder, 1954–73.*

Marcel Henri Stijns (d. 1967). *President of Honour, International Federation of Journalists. Editor in Chief, Het Laatste Nieuws, Brussels.*

John E. Stoner. *Emeritus Professor of Government, Indiana University, Bloomington.*

John Ford Stover. *Emeritus Professor of History, Purdue University, West Lafayette, Ind.*

Ruth Strang (d. 1971). *Professor of Education, Teachers College, Columbia University, 1940–60.*

Robert Strausz-Hupé. *U.S. Ambassador to Turkey. Emeritus Professor of Political Science, University of Pennsylvania, Philadelphia.*

Donald Stuart Strong (d. 1995). *Professor of Political Science, University of Alabama, Tuscaloosa, 1952–79.*

Roland Stucki. *Emeritus Professor of Banking and Finance, University of Utah, Salt Lake City.*

William C. Sturtevant. *Curator, Department of Anthropology, Smithsonian Institution, Washington, D.C.*

Ernst W. Swanson. *Emeritus Professor of Economics, North Carolina State University at Raleigh.*

L.E. Sweet. *Professor of Anthropology, University of Manitoba, Winnipeg.*

Philip Taft (d. 1976). *Professor of Economics, Brown University, Providence, R.I.*

Lawrence Edward Tanner (d. 1979). *Librarian, Westminster Abbey, London, 1956–72; Keeper of the Muniments, 1926–66.*

Sol Tax (d. 1995). *Professor of Anthropology, University of Chicago, 1948–76. Director, Center for the Study of Man, Smithsonian Institution, Washington, D.C., 1968–76.*

Sheldon Tefft. *James Parker Hall Professor Emeritus of Law, University of Chicago.*

Georges Tessier (d. 1967). *Professor of Diplomacy, École Nationale des Chartes (School of Paleography), Paris, 1930–61.*

Brinley Thomas (d. 1994). *Professor of Economics, University College, Cardiff, University of Wales, 1946–73.*

Bruce R. Thomas. *Freelance writer on labour matters.*

Joseph Anthony Charles Thomas (d. 1981). *Professor of Roman Law, University of London, 1965–81.*

Terence Barrington Thomas. *Director, Gladding International Ltd. Angling correspondent, The Field and others. Presenter of "Angling Today," Associated Television, Birmingham, Eng.*

William Miles Webster Thomas, Baron Thomas (d. 1980). *Chairman, Britannia Airways Ltd.; Neumo Ltd.; and other companies. Director, Sun Insurance Office, Ltd. President, National Savings Committee, 1965–72.*

David Thomson (d. 1970). *Master, Sidney Sussex College, University of Cambridge, 1957–70. Author of Europe Since Napoleon and others.*

Lynn Thorndike (d. 1965). *Professor of History, Columbia University, 1924–52.*

Samuel Edmund Thorne (d. 1994). *Fairchild Professor of Legal History, Harvard University, 1973–78.*

Fred J. Tickner (d. 1980). *Professor of Political Science, State University of New York at Albany.*

Nicholas S. Timasheff (d. 1970). *Professor of Sociology, Fordham University, New York City, 1949–57.*

Mischa Titiev. *Emeritus Professor of Anthropology, University of Michigan, Ann Arbor.*

Bursley Howland Titus. *Former Analyst, Department of the Army, Washington, D.C.*

Frederick Porter Todd (d. 1977). *Colonel, U.S. Army Reserve. Director, West Point Museum, U.S. Military Academy, 1953–65.*

Frederick B. Tolles (d. 1975). *Howard M. Jenkins Professor of Quaker History, Swarthmore College, Pa., 1954–70; Director, Friends Historical Library, 1941–70.*

Stanley Trapido. *Lecturer in the Government of New States, University of Oxford.*

Philip N(orton) Tucker. *Military Intelligence Research Specialist, Office of Assistant Chief of Staff, Intelligence, Department of the Army, Washington, D.C.*

Will C. Turnbladh. *Former Commissioner of Corrections, State of Minnesota.*

Lorenzo Dow Turner (d. 1972). *Professor of English, Roosevelt University, Chicago, 1946–69.*

Arthur Walter Tyler. *Former President, TYCO, Inc., Waltham, Mass.*

Frederick John Underhill. *Secretary, National Greyhound Racing Club Ltd., London.*

Dorothy Firman Van Ess (Mrs. John Van Ess) (d. 1975). *Missionary, Arabian Mission of the Reformed Church in America; Educational and social worker, Basra, Iraq, 1909–55.*

Harold Goodhue Vatter. *Emeritus Professor of Economics, Portland State University, Ore.*

Francis Joseph Violich. *Emeritus Professor of City Planning and of Landscape Architecture, University of California, Berkeley.*

Charles De Visscher (d. 1973). *Honorary President of the Institute of International Law. Judge, International Court of Justice, 1945–52.*

Sir Claud Humphrey Meredith Waldo (d. 1981). *Chichele Professor of Public International Law, University of Oxford, 1947–72.*

Pat Ward-Thomas. *Writer on golf.*

Donovan W.M. Waters. *Queen's Counsel. Scholars Professor of Law, University of Victoria, B.C. Associate Counsel, Douglas, Symes & Brissenden, Vancouver.*

Nathan A. Waxman. *Scholar of Caucasian languages.*

Paul David Webb. *Lecturer in Government, Brunel University, Uxbridge, Eng.*

Hans W. Weigert (d. 1983). *Director, Georgetown Research Project; Research Professor of Political Geography, Georgetown University, Washington, D.C.*

Joseph Sidney Weiner (d. 1982). *Professor of Environmental Physiology, 1965–80; Director, Medical Research Council Environmental Physiology Unit, 1962–80, London School of Hygiene and Tropical Medicine, University of London.*

William Thomas Wells (d. 1990). *Queen's Counsel. Member of Parliament for Walsall, Eng., 1945–55; Walsall North, 1955–74. General Staff Officer, 2nd Grade, Directorate of Military Training, War Office, London, 1942–45.*

Hans Fritz Welzel (deceased). *Professor of Penal Law and of the Philosophy of Law, Rhenish Friedrich Wilhelm University of Bonn, W.Ger.*

Roger J.R. Whistler. *Major; Regimental Secretary, Regimental Headquarters, Royal Military Police, Roussillon Barracks, Chichester, Eng.*

Harry George Whiteman. *Writer and critic.*

Trevor Williamson. *Chief Sports Subeditor, Daily Telegraph (London).*

Neill Compton Wilson. *Author of Treasure Express: Epic Days of Wells Fargo and others.*

Robert Renbert Wilson. *James B. Duke Professor Emeritus of Political Science, Duke University, Durham, N.C.*

Hans Julius Wolff (d. 1983). *Professor of Roman Law, Albert Ludwig University of Freiburg, Freiburg im Breisgau, W.Ger.*

William Lower Wonderly. *Translations Coordinator for Latin America, United Bible Societies, Mexico City.*

Arthur Evans Wood (d. 1960). *Professor of Sociology, University of Michigan, Ann Arbor.*

Michael Henry Woodford. *Secretary, British Falconers' Club, London, 1956–67.*

Ruth Frances Woodsmall (d. 1963). *United Nations Representative of International Alliance of Women. Chief of Women's Affairs, U.S. High Commission of Germany, 1948–52. General Secretary, World YWCA, 1934–48.*

Quincy Wright (d. 1970). *Professor of International Law, University of Chicago, 1931–56.*

Frederick S. Wyle. *Attorney.*

David Eryl Corbet Yale. *Emeritus Reader in English Legal History, University of Cambridge; Fellow of Christ's College, Cambridge.*

Dale Yoder (d. 1990). *Professor and Director, Bureau of Business Services and Research, California State University, Long Beach, 1967–75. Professor of Industrial Relations, Stanford University, California, 1959–66.*

Kimball Young (d. 1973). *Professor of Sociology, Northwestern University, Evanston, Ill., 1947–62.*

Carle Clark Zimmerman (deceased). *Associate Professor of Sociology, Harvard University.*

Robert Walter Zimmermann. *Retired foreign service officer, U.S. Department of State; Director, East Coast Affairs, 1976–79.*

George William Zinke (deceased). *Professor of Economics, University of Colorado, Boulder, 1946–73.*

Roman J. Zorn. *Professor of History, University of Nevada, Las Vegas.*

Part Six. Art

Gerald E.H. Abraham. *President, Royal Musical Association, 1970–74. Assistant Controller of Music, British Broadcasting Corporation, London, 1962–67. James and Constance Alsop Professor of Music, University of Liverpool, 1947–62.*

Irving Abrahamson. *Professor of English, Kennedy-King College, City Colleges of Chicago, 1970–89.*

Percy G. Adams. *Lindsay Young Professor Emeritus of English, University of Tennessee, Knoxville.*

Robert M. Adams (d. 1996). *Professor of English, University of California, Los Angeles, 1968–79.*

Jean Adhémar (d. 1987). *Curator of Prints, Bibliothèque Nationale, Paris, 1961–87.*

Gay Wilson Allen (d. 1995). *Professor of English, New York University, 1946–69.*

Walter E. Allen (d. 1995). *Professor of English Studies, New University of Ulster, Coleraine, N.Ire., 1968–73.*

Barthélemy Amengual. *Former Editor, Études Cinématographiques. Author of René Clair; Clés pour le cinéma.*

Reed Anderson. *Professor of Spanish and Portuguese, Miami University, Oxford, Ohio.*

J.A. Andrup. *Author of Latvian Literature and others.*

Noel Gilroy Annan, Baron Annan. *Vice-Chancellor, University of London, 1978–81; Provost of University College, 1966–78. Author of Leslie Stephen.*

Joseph Anthony. *Former Special Assignments Editor, Encyclopædia Britannica, Chicago.*

Giovanni Aquilecchia. *Emeritus Professor of Italian, University College, University of London.*

Arthur John Arberry (d. 1969). *Sir Thomas Adams Professor of Arabic, University of Cambridge, 1947–69.*

Annette Elizabeth Armstrong. *Former Fellow and Tutor in Modern Languages, Somerville College, Oxford; former Lecturer in French Literature, University of Oxford.*

H. Harvard Arnason (d. 1986). *Art historian. Vice President for Art Administration, Solomon R. Guggenheim Foundation, New York City, 1961–69.*

Denis Midgley Arnold (d. 1986). *Heather Professor of Music, University of Oxford, 1975–86.*

Steven Arnold. *Freelance writer on African literature.*

W. Geoffrey Arnott. *Emeritus Professor of Greek Language and Literature, University of Leeds, Eng.*

Elizabeth Mary Aslin (d. 1989). *Keeper, Bethnal Green Museum, Victoria and Albert Museum, London, 1974–81.*

James Stephen Atherton (deceased). *Lecturer in English Literature, Wigan and District Mining and Technical College, England. Author of The Books at the Wake.*

Marcelle Auclair (d. 1983). *Writer. Author of Enfances et mort de Garcia Lorca and others.*

Hans Aurenhammer. *Former Director, Austrian State Gallery, Vienna.*

Denis Bablet (d. 1992). *Director of Research; Director, Laboratory of Research on the Spectacle Arts, National Centre for Scientific Research, Paris.*

Anthony Cuthbert Baines (d. 1997). *Curator of the Bate Collection of historical wind instruments, University of Oxford, 1970–80.*

A. Craig Baird (d. 1979). *Professor of Speech, University of Iowa, Iowa City, 1928–52.*

Peter P. Baldass. *Author of Romanische Kunst in Österreich and others.*

The Rev. John Francis Bannon, S.J. (d. 1986). *Professor of History, St. Louis University, Mo., 1949–73.*

Eric Arthur Barber (d. 1965). *Rector of Exeter College, University of Oxford, 1943–56.*

Frederick P. Bargebuhr (d. 1978). *Professor of Religion, University of Iowa, Iowa City, 1962–70.*

Henry James Baron. *Professor of English, Calvin College, Grand Rapids, Mich.*

William Barr. *Former Senior Lecturer in Latin, University of Liverpool.*

Jean-Bertrand Barrère (d. 1985). *Professor of French Literature, University of Cambridge, 1954–82; Fellow of St. John's College, Cambridge.*

Eleanor Dodge Barton. *Former Professor and Chairman, Department of Art History, University of Hartford, West Hartford, Conn. Professor and Chairman, Department of Art, Sweet Briar College, Va., 1952–71.*

Jacques Barzun. *University Professor Emeritus, Columbia University; Dean of Faculties and Provost, 1958–67.*

Annette K. Baxter. *Former Professor of History, Barnard College, Columbia University. Author of Henry Miller, Expatriate.*

Germain René Michel Bazin (d. 1990). *Research Professor of Fine Arts, York University, Toronto, 1970–75. Chief Curator of Paintings and Drawings, the Louvre Museum, Paris, 1951–65.*

William Beare (d. 1963). *Professor of Latin, University of Bristol, Eng., 1931–63.*

Alexander Munro Beattie. *Emeritus Professor of English, Carleton University, Ottawa.*

Bernard Beckerman (d. 1985). *Brander Matthews Professor of Dramatic Literature, Columbia University, 1977–85.*

Karl Beckson. *Professor of English, Brooklyn College, City University of New York.*

John Bernard Beer. *Emeritus Fellow of Peterhouse, Cambridge; Emeritus Professor of English Literature, University of Cambridge.*

Charles G. Bell. *Poet and novelist. Emeritus Tutor, St. John's College, Santa Fe, N.M. Author of Delta Return; The Married Land; and others.*

Benedikt Sigurdur Benedikz. *Former Head of Special Collections, Library, University of Birmingham, Eng.*

Susan Elizabeth Benenson. *Former Assistant Keeper, Department of Western Art, Ashmolean Museum, University of Oxford.*

Michel N. Benisovich (d. 1963). *Art historian. Instructor, New York University.*

Albert S. Bennett. *Freelance writer. Senior Editor and Biographies Editor, The American Heritage Dictionary of the English Language, 1966–68.*

Joan Bennett (d. 1986). *Fellow of Girton College, Cambridge; Lecturer in English, University of Cambridge, 1936–64.*

Ian D. Bent. *Professor of Music, Columbia University.*

Harry Beran. *Senior Lecturer in Philosophy, University of Wollongong, Australia.*

William J. Berg. *Professor of French, University of Wisconsin, Madison.*

Walter G. Bergmann (d. 1988). *Editor, Schott and Co. Ltd., Music Publishers, London.*

John Dagfinn Bergsagel. *Musicologist, Institute of Musicology, University of Copenhagen.*

Joshua Berrett. *Former Assistant Professor of Humanities, Wayne State University, Detroit.*

Brenda Berrian. *Freelance writer on African literature.*

André Berry (d. 1986). *Author of Florilège des troubadours; Anthologie de la poésie occitane; and others.*

Albert Bettex. *Author and lecturer. Editor, Libarium, 1958–79.*

Alan Curtis Birnholz. *Associate Professor of Art History, State University of New York at Buffalo.*

Michael H. Black. *Fellow of Clare Hall, University of Cambridge. Former University Publisher, Cambridge University Press.*

Easley Blackwood. *Professor of Music, University of Chicago.*

James Blades. *Lecturer on music. Professional Timpanist, formerly with the English Opera Group and English Chamber Orchestra.*

Dimitry Dimitriyevich Blagoy (d. 1984). *Professor and Head, Department of Modern Russian Literature, Institute of World Literature, Academy of Sciences of the U.S.S.R., Moscow.*

Claude Blair. *Keeper of Metalwork, Victoria and Albert Museum, London, 1972–82.*

Walter Blair (d. 1992). *Professor of English, University of Chicago, 1944–68.*

José Manuel Blecuá. *Emeritus Professor of the History of Spanish Language and Literature, University of Barcelona.*

Carl Bode (d. 1993). *Professor of English, University of Maryland, College Park, 1947–82.*

Joseph Sullivan Bolt. *Emeritus Professor of Art History, University of Alabama, Tuscaloosa.*

Donald F. Bond (d. 1987). *Professor of English, University of Chicago, 1952–67.*

Jean Bonnerot (deceased). *Literary scholar and critic. Editor of Correspondance Générale de Sainte-Beuve and others.*

Jacques-Henry Bornecque. *Professor of Modern and Contemporary French Literature, University of Paris XIII.*

Marvin Sidney Borowsky (d. 1969). *Professor of Theatre Arts, University of California, Los Angeles.*

Umberto Bosco (d. 1987). *Professor of Italian Language and Literature, University of Rome, 1946–75. Director, Enciclopedia italiana.*

Margaret Innes Bouton. *Former Curator in Charge of Educational Work, National Gallery of Art, Washington, D.C.*

Alan Bowness. *Director, Henry Moore Foundation, London, 1988–94. Director, Tate Gallery, London, 1980–88.*

Charles Ralph Boxer. *Camoens Professor Emeritus of Portuguese, King's College, University of London.*

Muriel Clara Bradbrook (d. 1993). *Professor of English Literature, University of Cambridge, 1965–76; Mistress of Girton College, Cambridge, 1968–76.*

Johannes Christiaan Brandt Corstius. *Former Professor of Comparative Literature, State University of Utrecht, Neth.*

Edward Kamau Brathwaite. *Poet and critic. Professor of History, University of the West Indies, Mona (Kingston), Jamaica.*

Otto J. Brendel (d. 1973). *Professor of Art History and Archaeology, Columbia University, 1956–69.*

Liliana Brisby. *Freelance editor and writer on East-European affairs. Former Editor, The World Today. Author of Les Relations russo-bulgares, 1878–1886.*

Oscar Gross Brockett. *Z.T. Scott Family Professor of Drama, University of Texas at Austin.*

Victor Brombert. *Henry Putnam University Professor of Romance and Comparative Literature, Princeton University.*

Bernard Jocelyn Brooke (d. 1966). *Author of The Military Orchid and others.*

Anita Brookner. *Reader in the History of Art, Courtauld Institute of Art, University of London, 1977–88.*

Conrad Brown. *Emeritus Chief Editor, Adult Books, Grosset and Dunlap Inc., New York City.*

David Brown. *Emeritus Professor of Musicology, University of Southampton, Eng.*

Maurice J.E. Brown (d. 1975). *Author of Schubert: A Critical Biography; Essays on Schubert.*

Reginald Francis Brown (d. 1985). *Cowdray Professor of Spanish Language and Literature, University of Leeds, Eng., 1953–75.*

Robert Browning (d. 1997). *Professor of Classics and Ancient History, Birkbeck College, University of London, 1965–81.*

Charlotte H. Bruner. *Emeritus Professor of French, Iowa State University, Ames.*

Arnaldo Bruschi. *Professor of the History of Architecture, University of Rome.*

Doris Bry. *Writer on photography, art history, and natural science. Representative for the paintings of Georgia O'Keeffe.*

Sir Arthur Bryant (d. 1985). *Author of Samuel Pepys and many others.*

John Bryson (d. 1976). *Fellow of Balliol College, University of Oxford.*

J.A.B. Van Buitenen (d. 1979). *Distinguished Service Professor of Sanskrit and Indic Studies, University of Chicago, 1974–79.*

Donald B. Burness. *Professor of English, Franklin Pierce College, Rindge, N.H.*

Richard D.E. Burton. *Reader in French, University of Sussex, Brighton, Eng.*

John Burton-Page. *Former Reader in the Art and Archaeology of South Asia, School of Oriental and African Studies, University of London.*

Douglas Bush (d. 1983). *Gurney Professor of English Literature, Harvard University, 1957–66.*

Joseph T. Butler. *Senior Museum Director Emeritus, Historic Hudson Valley, Tarrytown, N.Y.*

Martin Butlin. *Former Keeper of the British Collection, Tate Gallery, London.*

John Everett Butt (d. 1965). *Regius Professor of Rhetoric and English Literature, University of Edinburgh, 1959–65.*

James F. Cahill. *Emeritus Professor of the History of Art, University of California, Berkeley.*

Henry Seidel Canby (d. 1961). *Literary critic. Founder and Editor, Saturday Review of Literature, 1924–36.*

Peter Cannon-Brookes. *Museum consultant. Keeper, Department of Art, National Museum of Wales, Cardiff, 1978–86.*

Harry Caplan (d. 1980). *Goldwin Smith Professor of the Classical Languages and Literature, Cornell University, Ithaca, N.Y., 1941–67.*

Sir Neville Cardus (d. 1975). *Music Critic*, *The Guardian* (London).

Margret A. Carey. Former Assistant Keeper, Department of Ethnography, British Museum, London.

Enzo Carli. Director, Cathedral Museum, Siena, Italy.

Arthur H. Cash. Distinguished Professor of English, State University of New York College at New Paltz.

Pierre-Georges Castex. Emeritus Professor of Modern French Literature, University of Paris.

Homero Castillo. Former Professor of Spanish, University of California, Davis.

James Caswell. Professor of Fine Arts, University of British Columbia, Vancouver.

Eduardo F. Catalano. Emeritus Professor of Architecture, Massachusetts Institute of Technology, Cambridge.

Jean-Louis Causou. Former Editor, *Opéra* (journal), Paris. Author of *Rossini*.

Charles Cestre (d. 1959). Professor of American Literature and Civilization, University of Paris, 1917–42.

Charles Chadwick. Emeritus Professor of French, University of Aberdeen, Scot.

John Chalker. Former Professor of English, Queen Mary and Westfield College, University of London.

Mary Chamot (d. 1993). Assistant Keeper, Tate Gallery, London, 1950–65.

Moti Chandra. Former Director, Prince of Wales Museum of Western India, Bombay.

Pramod Chandra. George P. Bickford Professor of Indian Art, Harvard University.

Françoise Choay. Professor of Urban Studies, University of Paris VIII. Author of *Le Corbusier and others*.

Chuang Shang-yen (d. 1980). Deputy Director, National Palace Museum, Taipei, Taiwan.

Charles Manning Hope Clark (d. 1991). Professor of History, Australian National University, Canberra, 1949–75.

James Midgley Clark (d. 1961). Professor of German, University of Glasgow, 1951–54.

Derek Plint Clifford. Freelance writer. Author of *A History of Garden Design and others*.

C.L. Cline. Ashbel H. Smith Professor Emeritus of English, University of Texas at Austin.

Raymond Cogniat (d. 1977). Principal Inspector of Fine Arts, 1943–67. Head of the arts section, *Le Figaro*, Paris, 1957–77.

Pierre Cogny. Senior Lecturer in French Literature, University of Caen, Fr.

John Michael Cohen (d. 1989). Writer, critic, and scholar noted for his translations of French, Spanish, and Russian classics.

Bruce Cole. Distinguished Professor of Fine Arts, Indiana University, Bloomington.

George R. Collins (d. 1993). Professor of Art History, Columbia University, 1962–86.

Peter Collins (d. 1981). Professor of Architecture, McGill University, Montreal.

Carl Wilbur Condit (d. 1997). Professor of Art, History, and Urban Affairs, Northwestern University, Evanston, Ill., 1961–82.

William G. Constable (d. 1976). Curator of Paintings, Boston Museum of Fine Arts, 1938–57.

Deryck V. Cooke (d. 1976). Musicologist. Music Presentation Editor, British Broadcasting Corporation, London, 1965–76.

Douglas Cooper (d. 1984). Art historian and critic. Author of *Courtauld Collection*, a Catalogue and others.

Martin Du Pré Cooper (d. 1986). Music Editor, *Daily Telegraph*, London, 1954–76.

Wayne F. Cooper. Freelance writer. Editor of *The Passion of Claude McKay*.

Gertrude Mary-Anne Coor (d. 1962). Art historian. Assistant, Institute for Advanced Study, Princeton, N.J., 1959–62.

Solange Corbin. Professor of Musicology, University of Poitiers, Fr.

Charles Philip Corney. Former Deputy Librarian, British Library of Political and Economic Science, University of London.

Robert B. Costello. Publications Editor, Museum of Modern Art, New York City.

Pierre Courthion. Vice President, Syndicate of the French Artistic Press, 1965–78. Author of *Klee; Manet; and many other monographs on modern European artists*.

David Cowan. Former Senior Lecturer in Arabic, School of Oriental and African Studies, University of London.

Edward Croft-Murray (d. 1980). Keeper, Department of Prints and Drawings, British Museum, London, 1954–73.

Gerhard Croll. Emeritus Professor of Musicology, University of Salzburg, Austria.

Anthony Cronin. Poet and critic.

Bosley Crowther (d. 1981). Creative consultant, Columbia Pictures, New York City, 1968–73. Screen critic and editor, *The New York Times*, 1940–68.

John Cruickshank (d. 1995). Emeritus Professor of French, University of Sussex, Brighton, Eng., 1962–89.

Margaret Campbell Crum. Assistant, Department of Western Manuscripts, Bodleian Library, University of Oxford.

Charles Cudworth (d. 1977). Curator, Pendlebury Library of Music, University of Cambridge.

Alan S. Curtis. Professor of Music, University of California, Berkeley.

Charles D. Cuttler. Emeritus Professor of Art History, University of Iowa, Iowa City.

David Daiches. Emeritus Professor of English, University of Sussex, Brighton, Eng.

Mary L. Daniel. Professor of Spanish and Portuguese, University of Wisconsin, Madison.

William Aubrey Darlington (d. 1979). Chief Drama Critic, *London Daily Telegraph*, 1920–68. *London Theatre Correspondent*, *The New York Times*, 1939–60.

O.R. Dathorne. Professor of English, University of Kentucky, Lexington.

Ronald Austin Davey. Emeritus Professor of Art, University of Alberta, Edmonton.

Donald Alfred Davie (d. 1995). Andrew W. Mellon Professor of Humanities, Vanderbilt University, Nashville, Tenn., 1978–88.

Margaret C. Davies-Mitchell. Emeritus Professor of French, University of Reading, Eng.

Harold Hess Davis (d. 1964). Phebe Estelle Spalding Professor of English Literature, Pomona College, Claremont, Calif.

J. Cary Davis. Emeritus Professor of Romance Languages, Southern Illinois University, Carbondale.

Margaret Josephine Dean-Smith (deceased). Author of *A Guide to English Folk Song Collections and others*.

William A. DeGregorio. Freelance writer and editor. Author of *The Complete Book of U.S. Presidents*.

George G. Dekker. Professor of English, Stanford University, Calif.

Joseph-Edouard-Marie-Ghislain Delmelle. Poet, essayist, and critic of art and literature. Member, International Academy of French Culture.

Frederic Paul Deloffre. Professor of French Literature, University of Paris III.

Ludwig Denecke. Director, Murhard Library of the City of Kassel and State Library, and Head of the Brothers Grimm Museum, Kassel, W.Ger., 1959–68.

Bernard Denvir (1994). Head, Department of Art History, Ravensbourne College of Art and Design, Chislehurst, Eng., 1970–81.

Wilfrid Desan. *Emeritus Professor of Philosophy, Georgetown University, Washington, D.C.*

Pierre Descargues. *Art historian and critic. Author of Frans Hals; Jan Vermeer; and other monographs.*

Hugues de Varine-Bohan. *Former Director, France-Portuguese Institute, Lisbon. Former Director, International Council of Museums, Paris.*

Leon Townsend Dickinson. *Emeritus Professor of English, University of Missouri, Columbia.*

Paul Dinnage. *Freelance writer, translator, and book reviewer. Formerly reviewer for literature, The Times (London) Literary Supplement, and for art, The Spectator.*

Maurice Willson Disher (d. 1969). *Author of Blood and Thunder; Clowns and Pantomimes; and others.*

Armel Hugh Diverres. *Emeritus Professor of French, University College of Swansea, University of Wales.*

Frederick J. Dockstader. *Museum consultant and art historian. Director, Museum of the American Indian, Heye Foundation, New York City, 1960–75.*

John V. Dodge (d. 1991). *Assistant and Managing Editor, 1938–60; Executive Editor, 1960–64; Senior Vice President, Editorial, 1964–70; Vice President, International Editorial, 1970–72. Encyclopædia Britannica, Inc., Chicago.*

Charles Reginald Dodwell (d. 1994). *Pilkington Professor of the History of Art; Director, Whitworth Art Gallery, Victoria University of Manchester, 1966–89.*

Frank Doeringer. *Professor of History, Lawrence University, Appleton, Wis.*

Robert Donington (d. 1990). *Musician and musicologist. Professor of Music, University of Iowa, Iowa City, 1964–73.*

Filippo Donini. *Cultural Expert, Cultural Relations Department, Italian Ministry of Foreign Affairs, Rome, 1972–76. Director, Italian Institute, London, 1961–72.*

David F. Dorsey, Jr. *Professor of English, Clark Atlanta University, Ga.*

Richard M. Dorson (d. 1981). *Director, Folklore Institute; Professor of History and Folklore, Indiana University, Bloomington, 1957–81.*

Brian Westerdale Downs (d. 1984). *Master of Christ's College, Cambridge, 1950–63; Professor of Scandinavian Studies, University of Cambridge, 1950–60.*

Kandioura Drame. *Freelance writer on African literature.*

Philip Drew. *Professor of English Literature, University of Glasgow.*

Laura Dru. *Records and Archives Department, Madame Tussaud's Ltd., London.*

Donald Reynolds Dudley (d. 1972). *Professor of Latin, University of Birmingham, Eng., 1955–72.*

Anne Schley Duggan (d. 1973). *Professor and Dean, College of Health, Physical Education and Recreation, Texas Woman's University, Denton.*

René Dumesnil (d. 1967). *Literary and music critic. Member, Academy of Fine Arts, Institute of France, 1965–67.*

Archibald A.M. Duncan. *Professor of Scottish History and Literature, University of Glasgow, 1962–93.*

Lowell Dunham. *Former Distinguished Regents' Professor of Modern Languages, University of Oklahoma, Norman.*

Manuel E. Duran. *Professor of Hispanic Literature, Yale University.*

Raymond E. Durnat. *Visiting Professor, University of East London, Eng. Author of Films and Feelings; Jean Renoir; and others.*

Wilma Robb Ebbitt. *Former Professor of English, Pennsylvania State University, University Park.*

Edwin Harold Eby. *Emeritus Professor of English, University of Washington, Seattle.*

Leon Edel. *Henry James Professor Emeritus of English and American Letters, New York University, New York City. Citizens' Professor Emeritus of English Literature, University of Hawaii at Manoa, Honolulu.*

Christopher Edmunds (d. 1990). *Composer. Examiner for the Trinity College of Music, London, 1940–78.*

Hugh Edwards. *Former Curator of Photography and Associate Curator, Department of Prints and Drawings, Art Institute of Chicago.*

Tudor Edwards. *Formerly Investigating Officer of Historic Buildings, Ministry of Town and Country Planning, England.*

Lorenz E.A. Eitner. *Emeritus Professor of Art, Stanford University, Calif.*

Sverker Ek (d. 1981). *Professor of Literary History, Göteborg University, Swed., 1931–55.*

Charles Grant Ellis. *Research Associate, The Textile Museum, Washington, D.C.*

Elmer Ellis (d. 1989). *President, 1955–66; Professor of History, University of Missouri, Columbia.*

Angna Enters (d. 1989). *Dancer, mime, and artist. Originator of phase dance mime. Author of On Mime.*

Walter Erben (d. 1981). *Professor of Art Education, College of Education of the Ruhr, Dortmund, W.Ger.*

Robert Escarpit. *Emeritus Professor of Information and Communication Sciences, University of Bordeaux III, Fr.*

Martin J. Esslin. *Emeritus Professor of Drama, Stanford University, Calif. Head of Radio Drama, British Broadcasting Corporation, London, 1963–77.*

Joan Evans (d. 1977). *President, Society of Antiquaries, London, 1959–64. Author of John Ruskin and many others.*

David Fagan. *Former Assistant Professor of Spanish and Portuguese, Indiana University, Bloomington.*

Alison (Anna Bowie) Fairlie (d. 1993). *Professorial Fellow of Girton College, Cambridge, 1972–80; Professor of French, University of Cambridge, 1972–80.*

Dennis Larry Ashwell Farr. *Director, Courtauld Institute Galleries, London, 1980–93.*

Suzanne Pier Fauteux. *Freelance writer.*

John Bailey Fernald (d. 1985). *Theatre Director. Principal, Royal Academy of Dramatic Art, London, 1955–65. Professor of Dramatic Art, Oakland University, Rochester, Mich., 1966–70.*

Robert J. Fernier (d. 1977). *President, The Friends of Gustave Courbet, Paris. Author of Gustave Courbet, peintre de l'art vivant.*

Andrew Field. *Professor of Comparative Literature, Griffith University, Brisbane, Australia.*

Roger Elwyn Fiske (d. 1987). *Musicologist and composer. Author of English Theatre Music in the Eighteenth Century; Ballet Music; and others.*

Ian Fletcher (d. 1988). *Professor of English Literature, University of Reading, Eng., 1978–82.*

Louis-Fernand Flutre (deceased). *Professor of Old French Language and Literature, University of Lyon, 1934–62.*

John Stuart Forbes. *Former Deputy Warden, The Worshipful Company of Goldsmiths, London.*

Patrick K. Ford. *Margaret Brooks Robinson Professor of Celtic Languages and Literatures, Harvard University.*

Nigel Fortune. *Former Reader in Music, University of Birmingham, Eng.*

Wallace Fowlie. *James B. Duke Professor Emeritus of French Literature, Duke University, Durham, N.C.*

Marcel Franciscono. *Professor of Art History, University of Illinois at Urbana-Champaign.*

George Sutherland Fraser (d. 1980). *Poet and critic. Reader in Modern English Literature, University of Leicester, Eng., 1964–79.*

Richard H. Freeborn. *Emeritus Professor of Russian Literature, School of Slavonic and East European Studies, University of London.*

Marion Valerie Friedmann (d. 1980). *Editor and translator. Author of The Slap; editor of I Will Still Be Moved: Reports from South Africa.*

Oluf Anker Friis (d. 1979). *Professor of Literature, University of Copenhagen, 1957–64.*

Holger Elof Uno Frykenstedt. *Former Lecturer in Literary History with Poetics, University of Stockholm.*

David Fuller. *Professor of Music, State University of New York at Buffalo.*

Jean Overton Fuller. *Codirector, Fuller d'Arch Smith Ltd. (rare books), London. Author of Swinburne: A Critical Biography and others.*

Richard Clair Gabriel. *Senior History Master, King's School, Worcester, Eng. Former Research Assistant, Institute of Historical Research, University of London.*

Hans Gal (d. 1987). *Composer and musicologist. Lecturer on Music, University of Edinburgh, 1945–65. Director of Municipal College of Music, Mainz, Ger., 1929–33.*

Edward J.C. Garden. *Emeritus Professor of Music, University of Sheffield, Eng.*

Dame Helen Gardner (d. 1986). *Merton Professor of English Literature, University of Oxford; Fellow of Lady Margaret Hall, Oxford, 1966–75.*

John F. Garganigo. *Professor of Spanish and Chairman, Department of Latin American Studies, Washington University, St. Louis, Mo.*

William Gaunt (d. 1980). *Art historian. Special correspondent on art subjects, The Times (London).*

Robert Gayre of Gayre and Nigg. *Editor, Armorial, Edinburgh, 1959–74.*

Karl Geiringer (d. 1989). *Professor of Music, University of California, Santa Barbara, 1962–73.*

Willi Geismeyer. *Former Director, National Gallery, National Museum of Berlin.*

Arthur Gelb. *President, New York Times Company Foundation; Managing Editor, The New York Times, 1986–89. Coauthor of O'Neill.*

Barbara Gelb. *Writer. Coauthor of O'Neill.*

Margaret Oliver Gentles. *Former Keeper of the Buckingham Collection of Japanese Prints; former Associate Curator of Oriental Art, Art Institute of Chicago.*

Albert S. Gerard. *Professor of Comparative Literature, State University of Liège, Belg., 1968–83.*

Philip L. Gerber. *Professor of English, State University of New York College at Brockport.*

Edwin Gerow. *Professor of Religion and Humanities, Reed College, Portland, Ore.*

Giuseppe Giangrande. *Former Professor of Classics, King's College, University of London.*

Robert Donald Davidson Gibson. *Emeritus Professor of French, University of Kent at Canterbury, Eng.*

Alexander Gillies (d. 1977). *Professor of German Language and Literature, University of Leeds, Eng., 1945–72.*

Giovanni Pietro Giorgetti. *Former Lecturer in Italian, Birkbeck College, University of London.*

Cuthbert Morton Girdlestone (d. 1975). *Professor of French, Universities of Durham and Newcastle upon Tyne, Eng., 1926–60.*

Nina C. Gitz. *Freelance writer and translator.*

Kurt Moritz Artur Goldammer. *Professor of Comparative History of Religions and of the History of Religious Art, Philipps University of Marburg, Ger.*

Frederick Goldbeck (d. 1981). *Critic and musicologist. Adviser for Music, Radiotélévision Française.*

Ludwig Goldscheider. *Art historian. Former director and designer of books for Phaidon Press Ltd., London. Author of Kokoschka and many others.*

Dale Good. *Editor, Compton's Encyclopedia. Librarian, Music Division, New York Public Library's Research Center for the Performing Arts at Lincoln Center, New York City, 1970–77.*

Robert Marshall Goodwin. *Racing correspondent, London.*

Sydney Charles Gould. *Former Reader in French and Comparative Literature, University of Bristol, Eng.*

Andrew Sydenham Farrar Gow (d. 1978). *Fellow of Trinity College, University of Cambridge; Brereton Reader in Classics, 1947–51.*

Alan Gowans. *Director, National Images of North American Living, Washington, D.C. Emeritus Professor of History in Art, University of Victoria, B.C.*

Philip Graham (d. 1967). *Professor of American Literature, University of Texas at Austin.*

Theodore C. Grame. *Author of Folk Music; America's Ethnic Music; and others.*

Serge Grandjean (d. 1989). *Keeper, Department of Objets d'Art, Louvre Museum, Paris.*

Benny Green. *Record reviewer, British Broadcasting Corporation. Jazz Critic, The Observer (London), 1958–77.*

Roger Lancelyn Green (d. 1987). *Author of The Story of Lewis Carroll and others; editor of The Diaries of Lewis Carroll.*

David Greene (d. 1981). *Senior Professor, School of Celtic Studies, Dublin Institute for Advanced Studies.*

Mark Gridley. *Former Lecturer in Music, Case Western Reserve University, Cleveland.*

F. Grossmann (d. 1984). *Senior Professor of Art History, University of Washington, Seattle.*

Henri Guillemin (d. 1992). *Professor of History of French Literature, University of Geneva, 1963–73.*

Masakatsu Gunji. *Honorary Professor of Kabuki Drama, Waseda University, Tokyo.*

Gordon S. Haight (d. 1985). *Professor of English, Yale University, 1950–68.*

Eric Halfpenny (d. 1979). *Editor, The Galpin Society Journal, 1963–70.*

Frieda F. Halpern. *Consultant on needlework.*

Charles E. Hamm. *Composer. Arthur Virgin Professor Emeritus of Music, Dartmouth College, Hanover, N.H.*

Craig S. Harbison. *Professor of Art History, University of Massachusetts at Amherst.*

Enriqueta Harris. *Honorary Fellow of the Warburg Institute, University of London. Author of Spanish Painting; Goya.*

Francis Llewellyn Harrison (d. 1987). *Professor of Ethnomusicology, University of Amsterdam, 1970–76. Reader in the History of Music, University of Oxford, 1962–70.*

William J. Harrison. *Consultant on industrial design.*

Kenneth Harrow. *Professor of Humanities, Michigan State University, East Lansing.*

Arnold Lionel Haskell (d. 1980). *Director, 1946–65, and Governor, 1966–77, Royal Ballet School; Governor, Royal Ballet, London, 1957–80.*

David Hately. *Critic and consultant on literature.*

Eric Alfred Havelock (d. 1988). *Sterling Professor of Classics, Yale University, 1963–71.*

David M. Hayne. *Emeritus Professor of French, University of Toronto.*

John A. Haywood. *Reader in Arabic, University of Durham, Eng., 1967–78.*

Arthur Hedley (d. 1969). *Secretary, British Chopin Society. Vice President, Jury of International Chopin Competitions, Warsaw, 1949–65.*

Ernst van Heerden. *Poet and critic. Emeritus Professor of Afrikaans and Netherlands, University of the Witwatersrand, Johannesburg.*

Julius S. Held. *Emeritus Professor of Art History, Barnard College, Columbia University.*

Ruth P. Hellman. *Consultant on lace, Metropolitan Museum of Art, New York City.*

Philip Prichard Henderson (d. 1977). *Freelance writer and editor. Author of William Morris: His Life, Work and Friends.*

Robert M. Henderson. *Chief, General Library and Museum of the Performing Arts, New York Public Library at Lincoln Center, New York City.*

Sir Philip Hendy (d. 1980). *Adviser to the Israel Museum, Jerusalem, 1968–71. Director, National Gallery, London, 1946–67.*

Julian Herbage (d. 1976). *Freelance musicologist, broadcaster, and writer.*

Don Herdeck. *Freelance writer on African literature.*

Barnard Hewitt. *Emeritus Professor of Theatre, University of Illinois, Urbana.*

Howard Hibbard (d. 1984). *Professor of Art History, Columbia University, 1966–84.*

A. Kent Hieatt. *Emeritus Professor of English, University of Western Ontario, London.*

David J.M. Higgins (d. 1975). *Associate Professor of English, Monmouth College, West Long Branch, N.J.*

Gilbert Highet (d. 1978). *Anthon Professor of Latin Language and Literature, Columbia University, 1950–72.*

Ronald Francis Hingley. *Fellow of St. Antony's College, Oxford; Lecturer in Russian, University of Oxford.*

André Hodeir. *Composer, conductor, and writer. Author of Jazz: Its Evolution and Its Essence.*

Reinhold D. Hohl. *Art historian. Author of Giacometti and others.*

Christina Stanley Hole. *Honorary Editor, Folklore. Author of English Custom and Usage; English Folklore; and others.*

Hans Egon Holthusen. *Professor of German, Northwestern University, Evanston, Ill., 1968–81.*

Yasuji Honda. *Former Professor of Drama, Waseda University, Tokyo. Member, Japanese Society for Theatre Research.*

Kenneth Hopkins (d. 1988). *Novelist and poet. Professor of English, Southern Illinois University, Carbondale, 1964–72.*

John Horden. *Author of Francis Quarles: A Bibliography of His Works to the Year 1800.*

Paul Horgan (d. 1995). *Professor of English, 1967–71; Author in Residence, Wesleyan University, Middletown, Conn., 1971–95.*

Louis Horst (d. 1964). *Teacher of Dance Composition, Juilliard School of Music. Managing Editor, Dance Observer.*

Graham Goulder Hough (d. 1990). *Professor of English, University of Cambridge, 1966–75; Fellow of Darwin College, Cambridge, 1964–75.*

William Driver Howarth. *Former Professor of French, University of Bristol, Eng.*

Ivan Hrbek (d. 1993). *Staff member, Oriental Institute, Czechoslovak Academy of Sciences, Prague, 1953–92.*

Garfield Hopkin Hughes (d. 1969). *Senior Lecturer in Welsh Language and Literature, University College of Wales, Aberystwyth, 1960–69.*

G(eorge) Haydn Huntley. *Emeritus Professor of Art, Northwestern University, Evanston, Ill.*

Jethro Hurt. *Former Instructor in the History of Art and Architecture, University of Illinois, Chicago.*

Dyneley Hussey (d. 1972). *Music Critic, The Times (London), 1923–46; The Listener, 1946–60. Author of Verdi; Some Composers of Opera.*

Lawrence E. Hussman. *Professor of English, Wright State University, Dayton, Ohio.*

Hans Huth (d. 1977). *Curator of Decorative Arts, Art Institute of Chicago, 1958–63.*

Herbert Henry Huxley. *Emeritus Professor of Classics, University of Victoria, B.C. Supervisor in Classics, St. John's College, University of Cambridge, 1979–85.*

Gerard Willem Huygens. *Professor of History and Dutch Literature, Rotterdam Lyceum.*

René Huyghe. *Professor of Art, College of France, Paris, 1950–76. President, Council of Museums, Paris, 1974–88.*

Stuart Wallace Hyde. *Professor of Broadcast Communication Arts, San Francisco State University.*

Isabelle Hyman. *Professor of Fine Arts, Washington Square and University College of Arts and Science, New York University, New York City.*

Catherine Mills Ing (d. 1983). *Fellow of St. Hilda's College, Oxford; Senior Lecturer in English Literature, University of Oxford.*

Hans Dietrich Irmscher. *Professor of Modern German Literary Criticism, University of Cologne.*

John H.B. Irving. *Director, Education Division, WGBH Educational Foundation, Boston.*

David Irwin. *Professor and Chairman, Department of History of Art, University of Aberdeen, Scot.*

Elizabeth Jachimowicz. *Former Curator of Costumes, Chicago Historical Society.*

Ian Jack. *Emeritus Professor of English Literature, University of Cambridge.*

Stephen W. Jacobs. *Former Professor of Architecture, Cornell University, Ithaca, N.Y.*

Hans L.C. Jaffé (d. 1992). *Professor of Modern Art History, University of Amsterdam, 1963–84.*

Richard Edward Warwick James. *Former Assistant Curator, Barber Institute of Fine Arts; former Lecturer in History of Art, University of Birmingham, Eng.*

William Louis G. James. *Professor of Victorian and Modern English Literature, University of Kent at Canterbury, Eng.*

H.W. Janson (d. 1982). *Professor of Fine Arts, Washington Square College of Arts and Science, New York University, New York City, 1949–79.*

Alexander Norman Jeffares. *Emeritus Professor of English, University of Stirling, Scot.*

Harold Jenkins. *Emeritus Professor of Rhetoric and English Literature, University of Edinburgh.*

Romilly James Heald Jenkins (d. 1969). *Professor of Byzantine History and Director of Studies, Harvard University Dumbarton Oaks Research Library and Collection, 1960–69.*

Frederick L. Jones (d. 1973). *Professor of English, University of Pennsylvania, Philadelphia.*

Joseph Jay Jones. *Emeritus Professor of English, University of Texas at Austin.*

Bertram Leon Joseph (d. 1981). *Professor of Drama; Chairman, Department of Theatre, Queens College, City University of New York, 1970–81.*

Wayne Kamin. *Research Associate in African and Afro-American Studies, University of Texas at Austin.*

Maxine Kanter. *Freelance writer on music.*

Ben Zion Kaplan. *President, Universal Hairpieces, New York City.*

Edgar Kaufmann, Jr. (d. 1989). *Adjunct Professor of the History of Architecture, Columbia University. Director, Department of Industrial Design, Museum of Modern Art, New York City, 1946–50.*

Martin J. Kemp. *Professor of the History of Art, University of Oxford.*

Elsbeth Mary Kennedy. *Lecturer in French, University of Oxford; Fellow of St. Hilda's College, Oxford.*

Michael Kennedy. *Chief Music Critic, Sunday Telegraph, London.*

Edward John Kenney. *Kennedy Professor Emeritus of Latin, University of Cambridge.*

Herbert Leon Kessler. *Professor of the History of Art, Johns Hopkins University, Baltimore.*

Arnold Charles Kettle (d. 1986). *Professor of Literature, Open University, Walton, Eng., 1970–81.*

Heinz Kindermann (d. 1985). *Professor of Drama, University of Vienna. Chairman, Commission for the History of the Austrian Theatre, Austrian Academy of Sciences, Vienna. Vice President, International Institute for Theatrical Research, Vienna.*

Donald King. *Deputy Keeper, Victoria and Albert Museum, London.*

Peter K. King. *Former Director, Institute of Modern Dutch Studies, University of Hull, Eng.*

A.M. Kinghorn. *Professor of English, University of Qatar, Doha.*

Romas Kinka. *Former Lecturer in Lithuanian, University of Chicago. Vice-Director of the Lithuanian Institute of Education, Chicago.*

The Rev. James Kinsley (d. 1984). *Professor and Head, Department of English Studies, University of Nottingham, Eng., 1961–84. General Editor, Oxford English Novels, 1967–77.*

F.E. Kirby. *Emeritus Professor of Music, Lake Forest College, Ill.*

Ralph Kirkpatrick (d. 1984). *Harpsichordist. Professor of Music, Yale University, 1965–76.*

Lincoln Edward Kirstein (d. 1996). *General Director, New York City Ballet Company, 1948–89.*

Michael William Lely Kitson. *Director of Studies, Paul Mellon Centre for Studies in British Art, London, 1986–92.*

Tibor Klaniczay (d. 1992). *Director, Institute of Literary Studies, Hungarian Academy of Sciences, Budapest, 1984–92.*

Margaret Brown Klapthor. (d. 1994). *Curator, Division of Political History, 1968–72; Chairman, Collections Committee, National Museum of American History, Smithsonian Institution, Washington, D.C., 1977–83.*

Carl Frederick Klinck. *Emeritus Professor of Canadian Literature, University of Western Ontario, London.*

Jan Knappert. *Former Lecturer in Bantu, School of Oriental and African Studies, University of London.*

Arthur Knight (d. 1991). *Professor of Cinema, University of Southern California, Los Angeles, 1967–85. Film Critic, The Hollywood Reporter, 1973–86.*

Dorothy Knowles. *Historian of modern French drama. Honorary Research Fellow, Bedford College, University of London.*

H.F. Koeper. *Professor of Architectural History, California State Polytechnic University, Pomona.*

Dame Leonie Judith Kramer. *Chancellor and Emeritus Professor of Australian Literature, University of Sydney.*

Sven Møller Kristensen. *Professor of Scandinavian Literature, University of Copenhagen, 1964–79.*

George Alexander Kubler (d. 1996). *Sterling Professor of the History of Art, Yale University, 1975–83.*

Daniel P. Kunene. *Professor of African Languages and Literature, University of Wisconsin, Madison.*

David M. Kunzle. *Professor of Art History, University of California, Los Angeles.*

Ado Kyrou. *Writer, motion-picture and television director. Author of Luis Buñuel and others.*

Kai L.K. Laitinen. *Professor of Finnish Literature, University of Helsinki, 1982–89.*

Basil Raymond Lam (d. 1984). *Conductor and harpsichordist. Organizer of Pre-Classical Music Programmes, British Broadcasting Corporation.*

Norman Jones Lamb. *Former Senior Lecturer in Portuguese and Spanish, University of Liverpool.*

H.C. Robbins Landon. *Freelance writer and music historian. Honorary Professorial Fellow, University of Wales College of Cardiff, 1971–79. Coeditor, Haydn Yearbook.*

Richard Lane. *Research Associate, Honolulu Academy of Arts. Author of Masters of the Japanese Print.*

Paul M. Laporte. *Emeritus Professor of Art History, Immaculate Heart College, Los Angeles.*

Mary Madge Lascelles (d. 1995). *Reader in English Literature, University of Oxford, 1966–67.*

Jan Lauts. *Director, Karlsruhe Art Gallery, W.Ger., 1956–73.*

Pierre Lavedan. *Director, Institute of Town Planning, University of Paris, 1940–65; Professor, Faculty of Letters, 1930–55.*

Janko Lavrin (d. 1986). *Professor of Russian Literature, University of Nottingham, Eng., 1923–53.*

Reginald Norcom Lawrence (d. 1967). *Playwright. Lecturer in Speech, City College, City University of New York.*

Frederick Laws (d. 1976). *Freelance journalist and art critic.*

Luis Leal. *Emeritus Professor of Spanish, University of Illinois, Urbana.*

Lewis Leary (d. 1990). *William Rand Kenan, Jr., Professor of English, University of North Carolina at Chapel Hill, 1968–76.*

Raymond Lebègue (d. 1984). *Professor of 16th- and 17th-Century French Literature, University of Paris. Officer of the Legion of Honour.*

Robert Lebel (d. 1986). *Art expert, critic, and writer. Author of On Marcel Duchamp and others.*

Eileen Le Breton. *Reader in French, Bedford College, University of London.*

Clifford Leech (d. 1977). *Professor of English, University of Toronto, 1963–74.*

Trevor LeGassick. *Professor of Arabic, University of Michigan, Ann Arbor.*

Dominica Legge (d. 1986). *Professor of Anglo-Norman Studies, University of Edinburgh, 1968–73.*

Andrew George Lehmann. *Emeritus Professor, School of European Studies, University of Buckingham, Eng.*

Richard Lepine. *Freelance writer on African literature.*

Pierre Leprohon (deceased). *Writer and journalist. Author of Jean Renoir; Charles Chaplin; Antonioni; and others.*

Laurence Elliot Libin. *Frederick P. Rose Curator of Musical Instruments, Metropolitan Museum of Art, New York City.*

Ronald William Lightbown. *Keeper of Metalwork, Victoria and Albert Museum, London, 1984–89.*

Bernth Lindfors. *Professor of English and African Literatures, University of Texas at Austin.*

Sten Hjalmar Lindroth. *Professor of the History of Science and Ideas, University of Uppsala, Swed.*

Anne Lippert. *Professor of French, Ohio Northern University, Ada.*

René Felix Lissens. *Emeritus Professor of Dutch and General Literature, St. Ignatius University Faculty, Antwerp, Belg.*

Ian Littlewood. *Lecturer in English, University of Sussex, Brighton, Eng.*

David Mathias Lloyd-Jones. *Musicologist and conductor. Founder and Artistic Director, Opera North, Leeds, Eng., 1978–90.*

Edward Lockspeiser (d. 1973). *Writer and broadcaster on music. Author of Debussy: His Life and Mind and others.*

David Loshak. *Assistant Professor of Art History, University of Wisconsin, Madison, 1958–64.*

John Evelyn Lowe. *Director, Weald and Downland Open Air Museum, Sussex, Eng., 1969–74. Principal, West Dean College, 1972–78.*

Constance Lowenthal. *Executive Director, International Foundation for Art Research, New York City.*

Bates Lowry. *Director, National Building Museum, Washington, D.C. Professor of Art History, University of Massachusetts, Boston, 1971–80.*

Wilfrid Irvine Lucas (d. 1973). *Professor of German, University of Southampton, Eng., 1954–71.*

Georg Hans Luck. *Emeritus Professor of Classics, Johns Hopkins University, Baltimore.*

Henry Julius Philip Maas. *Joint Head of Academic Staff and Tutor in Classics, Moreton Hall, Oswestry, Eng. Coeditor of The Letters of Ernest Dowson and others.*

Thomas Ollive Mabbott (d. 1968). *Professor of English, Hunter College, City University of New York, 1946–66.*

Richard Dyer MacCann. *Professor of Film, University of Iowa, Iowa City.*

Giovanni Macchia. *Professor of French Language and Literature, University of Rome.*

Ivy Lilian McClelland. *Former Reader in Spanish, University of Glasgow.*

Arthur Kilgore McComb (deceased). *Author of The Baroque Painters of Italy and others.*

Raven I. McDavid, Jr. (d. 1984). *Professor of English and of Linguistics, University of Chicago, 1964–77.*

The Rev. Eric McDermott, S.J. *Associate Professor Emeritus of History, Georgetown University, Washington, D.C.*

Sheila D. McDonough. *Professor of Religion, Sir George Williams University, Montreal.*

Robert Law McDougall. *Professor of English; Carleton University, Ottawa; General Editor, The Carleton Library.*

Sheila Roberts McGuire. *Professor of English and African Studies, Michigan State University, East Lansing.*

Joseph Machlis. *Emeritus Professor of Music, Queens College, City University of New York.*

Christine McHugh. *Attorney. Associate, Pellettieri, Rabstein, and Altman, Princeton, N.J.*

Roy Donald McMullen (d. 1984). *Art historian, Author of Art, Affluence, and Alienation; The World of Marc Chagall; and others.*

Hugo A. McPherson. *Professor of English, McGill University, Montreal. Chairman and Commissioner, National Film Board of Canada, Montreal, 1967–70.*

Walter James Macqueen-Pope (d. 1960). *Writer on the theatre. Author of Haymarket: Theatre of Perfection and others.*

David Magarshack (d. 1977). *Author of Chekhov the Dramatist; Dostoevsky; Pushkin: A Biography and many other works on Russian writers.*

Claude-Edmonde Magny (d. 1966). *Teacher of Philosophy, University of Paris.*

Francis Peabody Magoun, Jr. (d. 1979). *Professor of English, Harvard University, 1951–61.*

Jean Mallion. *Lecturer, Faculty of Literature and Humane Studies, University of Grenoble, France.*

William P. Malm. *Emeritus Professor of Musicology, University of Michigan, Ann Arbor.*

Charles Mancuso. *Associate Professor of the Performing Arts, State University of New York College at Buffalo.*

William Somervell Mann (d. 1989). *Chief Music Critic, The Times (London), 1960–82.*

Roger Manvell (d. 1987). *Biographer and film historian. University Professor of Film, Boston University. Director, British Film Academy, 1947–59.*

Leslie A. Marchand. *Emeritus Professor of English, Rutgers University, New Brunswick, N.J.*

Valerio Mariani (deceased). *Professor of the History of Art, University of Naples.*

Sidney Marrat. *Journalist, literary critic, and theatre historian.*

Leonard Cyril Martin (d. 1976). *King Alfred Professor of English Literature, University of Liverpool, 1929–51.*

Colin Mason (d. 1971). *Music critic. Editor, Tempo, 1964–71.*

D.E.S. Maxwell. *Former Professor of English, York University, Toronto.*

Claude Albert Mayer. *Former Professor and Head, Department of French, University of Liverpool.*

Ralph Mayer (d. 1979). *Painter. Director, Artists Technical Research Institute. Lecturer in Painting, Columbia University, 1944–64.*

El-Hadji Mbengue. *Associate Professor of African Studies, Howard University, Washington, D.C.*

John Miller. *Researcher and writer on music.*

Michael Millgate. *University Professor Emeritus of English, University of Toronto.*

Sandra Millikin. *Freelance architectural historian. Lecturer in the History of Art, Open University, Walton, Eng., 1971–73.*

Henry A. Millon. *Dean, Center for Advanced Study in the Visual Arts, National Gallery of Art, Washington, D.C.*

William Mishler. *Associate Professor of Scandinavian, University of Minnesota, Minneapolis.*

Donald (Charles Peter) Mitchell. *Music critic and publisher. Chairman, Faber Music Ltd., London.*

Jean Mitry (d. 1988). *Professor and Director, Cinema Division, Institute of Art and Archaeology, University of Paris I.*

Arthur Mizener (d. 1988). *Mellon Foundation Professor of Humanities, Cornell University, Ithaca, N.Y.*

Hans Moldenhauer. *Musicologist. Director, Moldenhauer Archives. President, Spokane Conservatory of Music and Allied Arts, Inc., Wash.*

Lillian Moore (d. 1967). *Dancer. Member of Faculty, American Ballet Center, New York City.*

Sonia Moore (d. 1995). *Founder and President, American Center for Stanislavski Theatre Art, Inc., New York City, 1964–95. Founder and Artistic Director, American Stanislavski Theatre, 1970–95.*

Will G. Moore (d. 1978). *Reader in French Literature, University of Oxford.*

Albert Mordell (deceased). *Author of Quaker Militant: John Greenleaf Whittier and others.*

Anne-Marie de Moret. *Freelance writer on African literature.*

Edwin George Morgan. *Poet. Titular Professor of English, University of Glasgow, 1975–80.*

Brita Maud Ellen Mortensen (d. 1958). *Lecturer in Swedish, University of Cambridge, 1950–58.*

Charles Moseley. *Freelance writer.*

Frank Luther Mott (d. 1964). *Dean, School of Journalism, University of Missouri, Columbia, 1942–51.*

Joachim Müller. *Professor of German Literature, Friedrich Schiller University of Jena, Ger.*

Hugo Munsterberg (d. 1995). *Fellow and Professor of Oriental Art, Bard College, Annandale-on-Hudson, N.Y., 1978–88.*

Peter J. Murray (d. 1992). *Professor of the History of Art, Birkbeck College, University of London, 1967–80.*

Reginald P.C. Mutter. *Emeritus Professor of English Literature, University of Sussex, Brighton, Eng.*

Bernard S. Myers (d. 1993). *Art historian. Editor in Chief and Manager, Art Books Department, McGraw-Hill Book Company, New York City, 1958–70.*

Rollo H. Myers (d. 1985). *Writer on music. Author of Music in the Modern World; Ravel: Life and Works and others.*

Maurice Nadeau. *Editor, Lettres Nouvelles and La Quinzaine Littéraire, Paris.*

Alois M. Nagler (d. 1993). *Henry McCormick Professor of Dramatic History and Criticism, Yale University, 1965–76.*

James Thompson Nardin. *Professor of English, Louisiana State University, Baton Rouge.*

Ray Nash (d. 1982). *Professor of Art, Dartmouth College, Hanover, N.H., 1949–70.*

Robert J. Nelson. *Professor of French Literature, University of Illinois at Urbana-Champaign.*

Israel Vladimirovich Nestyev. *Former Chief Scientist, Research Institute of History of Arts, Moscow.*

Arthur Hobart Nethercot. *Franklyn Bliss Snyder Professor Emeritus of English, Northwestern University, Evanston, Ill.*

Dika Newlin. *Composer. Professor of Music, Virginia Commonwealth University, Richmond.*

Robert Brayton Nichols. *Landscape architect.*

Norman Cornthwaite Nicholson (d. 1987). *Poet and critic. Author of H.G. Wells and others.*

Romola Nijinsky (d. 1978). *Author of Nijinsky; The Last Years of Nijinsky.*

Robert Niklaus. *Emeritus Professor of French, University of Exeter, Eng.*

Arnoldus Noach (d. 1976). *Professor of the History of Art and Architecture, University of Leeds, Eng.*

J. Jeremy Noble. *Professor of Music, State University of New York at Buffalo.*

Linda Weinberg Nochlin. *Distinguished Professor of Art History, Graduate Center, City University of New York.*

Paul F. Norton. *Professor of Art, University of Massachusetts, Amherst.*

Bonnie Oberman. *Freelance writer.*

Francis Valentine O'Connor. *Fellow, National Humanities Center, Research Triangle Park, N.C., 1994–95. Editor, Federal Art Patronage Notes, 1974–83.*

Donald Mitchell Oenslager (d. 1975). *Designer of scenery and theatre consultant. Professor of Scene Design, Yale University.*

James Francis O'Gorman. *Grace Slack McNeil Professor of the History of American Art, Wellesley College, Mass.*

Kenneth O'Leary. *Former Associate Professor of English, Seton Hall University, South Orange, N.J.*

Aladar Olgyay (d. 1963). *Architect. Author of Solar Control and Shading Devices and others.*

Gerrit Olivier. *Professor of Afrikaans and Netherlandish, University of the Witwatersrand, Johannesburg.*

Carola Oman (Lady Lenanton) (d. 1978). *Biographer. Author of David Garrick and others.*

Peter M. Opie (d. 1982). *Coauthor of The Oxford Dictionary of Nursery Rhymes; The Lore and Language of Schoolchildren; Children's Games in Street and Playground.*

Masako Osako. *Freelance writer on Japanese literature and affairs.*

Christian F. Otto. *Professor of the History of Architecture, Cornell University, Ithaca, N.Y.*

Peter D. Owen. *Painter and printmaker. Former Senior Lecturer, Croydon College of Design and Technology, Eng.*

Oyekan Owomoyela. *Professor of Literature and Drama, University of Nebraska, Lincoln.*

(William Cyril) Desmond Pacey (d. 1975). *Vice President; Professor of English, University of New Brunswick, Fredericton.*

Sir Denys (Lionel) Page (d. 1978). *Regius Professor of Greek, University of Cambridge, 1950–73.*

George Duncan Painter. *Assistant Keeper in charge of incunabula, Department of Printed Books, British Library, London, 1954–74.*

Rodolfo Pallucchini (d. 1989). *Director, Institute of Art History, Giorgio Cini Foundation, Venice, 1972–89.*

Guido Pannain (d. 1977). *Professor of the History of Music, S. Pietro a Maiella Conservatory of Music, Naples.*

John T. Paoletti. *Professor of Art History, Wesleyan University, Middletown, Conn.*

Alexander A. Parker (d. 1989). *Professor of Spanish Literature, University of Texas at Austin, 1970–78.*

Robert Lewis Parkinson (d. 1991). *Chief Librarian and Historian, Circus World Museum, Baraboo, Wis., 1965–91.*

Stephen Maxfield Parrish. *Goldwin Smith Emeritus Professor of English, Cornell University, Ithaca, N.Y.*

Dorothy Margaret Partington (d. 1990). *Literary historian and critic.*

Roy Pascal (d. 1980). *Professor of German, University of Birmingham, Eng., 1939–69.*

Günter Passavant. *Former Editor, Mitteilungen, Institute for the Study of the History of Art, Florence.*

David Patterson. *President, Oxford Centre for Post-Graduate Hebrew Studies; Cowley Lecturer in Post-Biblical Hebrew, University of Oxford; Fellow of St. Cross College, Oxford.*

Damião Antônio Peres. *Former Professor of History, University of Coimbra, Port. Member, Portuguese Academy of History.*

Roy Perrott. *Freelance book editor and consultant. Author of The Aristocrats.*

Lino Pertile. *Reader in Italian, University of Sussex, Brighton, Eng.*

Gabor F. Peterdi. *Painter and printmaker. Emeritus Professor of Printmaking, Yale University.*

Helene Peters. *Professor of French, Macalester College, St. Paul, Minn.*

Edwin Burr Pettet. *Former Schulman Professor of Theatre Arts, Brandeis University, Waltham, Mass.*

Friedrich Pfister (deceased). *Professor of Classical Philology, University of Würzburg, W.Ger.*

James Smith Pierce. *Professor of Art History, University of Kentucky, Lexington.*

André Pierre (d. 1966). *Member of Editorial Staff, Le Monde, Paris, 1944–58.*

Hovhanness Israel Pilikian. *Theatre director. Founder and Artistic Director of Hana-no Mask-Theatre Company.*

Patricia Garland Pinka. *Professor of English, Agnes Scott College, Decatur, Ga.*

Vivian de Sola Pinto (d. 1969). *Professor of English, University of Nottingham, Eng., 1938–61.*

Henry C. Pitz (d. 1976). *Writer and painter. Professor of Art, Philadelphia College of Art, 1934–60.*

Adolf K. Placzek. *Avery Librarian Emeritus, Columbia University.*

Giles William Playfair (d. 1996). *Freelance writer. Professor of Drama, Williams College, Williamstown, Mass., 1956–63.*

Henry A. Pochmann (d. 1973). *Professor of English, University of Wisconsin, Madison, 1938–71.*

Georg Poensgen. *Formerly Director of the Palatinate Museum, Heidelberg, W.Ger.*

Peter J. Pollack (d. 1978). *Photographer and lecturer. Author of The Picture History of Photography and others.*

Sir John Pope-Hennessy (d. 1994). *Professor of Fine Arts, New York University, 1977–92. Consultative Chairman, Department of European Paintings, Metropolitan Museum of Art, New York City, 1977–86.*

William V. Porter. *Professor of Music History and Literature, Northwestern University, Evanston, Ill.*

Frederick A. Pottle (d. 1987). *Sterling Professor of English, Yale University, 1944–66.*

John Povey. *Professor of English, University of California, Los Angeles.*

Anthony Powell. *Novelist, playwright, and literary critic.*

Mario Praz (d. 1982). *Professor of English Language and Literature, University of Rome, 1934–66.*

Joseph Prescott. *Emeritus Professor of English, Wayne State University, Detroit.*

Cecil John Layton Price. *Emeritus Professor of English Language and Literature, University College of Swansea, University of Wales.*

Brian Priestman. *Orchestral conductor. Former Dean, Faculty of Music, University of Cape Town.*

Jules David Prown. *Paul Mellon Professor of the History of Art, Yale University.*

Ricardo Quintana. *Emeritus Professor of English, University of Wisconsin, Madison.*

Regula B. Qureshi. *Mactaggart Fellow, Department of Music, University of Alberta, Edmonton.*

Chaim Rabin. *Former Professor of Hebrew Language, Hebrew University of Jerusalem.*

Frederic James Edward Raby (d. 1966). *Fellow and Lecturer, Jesus College, University of Cambridge, 1948–54. Author of A History of Christian Latin Poetry and others.*

Kathleen Raine. *Poet and scholar. Author of Collected Poems; Blake and Tradition; and others.*

Gilbert Reaney. *Professor of Musicology, University of California, Los Angeles.*

Frederick Stephen Reckert. *Former Camoens Professor of Portuguese, King's College, University of London.*

Willi Reich (d. 1980). *Music critic. Author of The Life and Work of Alban Berg and many others.*

John Cowie Reid (d. 1972). *Professor of English, University of Auckland, N.Z.*

Donald H. Reiman. *Adjunct Professor of English, University of Delaware, Newark. General Editor, The Bodleian Shelley Manuscripts.*

Hans Siegbert Reiss. *Emeritus Professor of German, University of Bristol, Eng.*

Graham Reynolds. *Keeper, Departments of Prints and Drawings, 1961–74, and of Paintings, 1959–74, Victoria and Albert Museum, London.*

Edgar Preston Richardson (d. 1985). *President, Pennsylvania Academy of the Fine Arts, 1968–70. Director, Detroit Institute of Arts, 1945–62, and Winterthur Museum, Wilmington, Del., 1962–66.*

Margaret Ann Richardson. *Curator, Sir John Soane's Museum, London.*

Gisela Marie Augusta Richter (d. 1972). *Curator, Greek and Roman Department, Metropolitan Museum of Art, New York City.*

Christopher Bruce Ricks. *Professor of English, Boston University.*

Alexander L. Ringer. *Emeritus Professor of Musicology, University of Illinois at Urbana-Champaign.*

William Andrew Ringler, Jr. (d. 1987). *Professor of English, University of Chicago, 1962–80.*

Charles Martin Robertson. *Lincoln Professor of Classical Archaeology and Art, University of Oxford, 1961–78.*

Jean Robertson (d. 1990). *Senior Lecturer in English Literature, University of Southampton, Eng.*

W. Andrew Robinson. *Author of Satyajit Ray: The Inner Eye.*

Charles Alan Robson. *Former Reader in French Philology and Old French Literature, University of Oxford.*

William Wallace Robson (d. 1993). *Masson Professor of English Literature, University of Edinburgh, 1972–90.*

Jerome Laurence Alexander Roche (d. 1994). *Reader in Music, University of Durham, Eng.*

Anne F. Rockwell. *Freelance writer and illustrator. Author of Glass, Stones and Crown: The Abbé Suger and the Building of St. Denis and others.*

Emir Rodriguez-Monegal (d. 1985). *Professor of Latin-American and Comparative Literature, Yale University.*

Leonard R. Rogers. *Sculptor and writer. Former Head, Faculty of Three-Dimensional Design, College of Art and Design, Loughborough, Eng.*

Pierre M. Rosenberg. *President-Director, Louvre Museum, Paris.*

Sybil (Marion) Rosenfeld (d. 1996). *Theatre historian and writer. Coeditor, Theatre Notebook, 1945–85.*

Marion Dean Ross. *Emeritus Professor of Architecture, University of Oregon, Eugene.*

Ronald Rossner. *Freelance writer on African literature.*

Cecil Roth (d. 1970). *Editor in Chief, Encyclopaedia Judaica. Reader in Jewish Studies, University of Oxford, 1939–64.*

The Rev. Erik Reginald Routley (d. 1982). *Professor of Church Music, Westminster Choir College, Princeton, N.J., 1975–82.*

Eleanor Ruggles. *Biographer. Author of Prince of Players: Edwin Booth and others.*

Eberhard Ruhmer. *Former Curator in Chief, Bavarian State Painting Collection, Munich.*

Harold Rutland (d. 1977). *Music critic. Examiner, Trinity College of Music, London. Editor, The Musical Times, 1957–60.*

Elizabeth Sabiston. *Academic Adviser, Stong College, York University, Downsview, Ont.*

Stanley Sadie. *Editor, The New Grove Dictionary of Music and Musicians and companion dictionaries, London.*

William Merritt Sale, Jr. (d. 1981). *Goldwin Smith Professor of English, Cornell University, Ithaca, N.Y.*

Mario Salmi (d. 1980). *Professor of the History of Medieval and Modern Art, University of Rome.*

Kaarlo Salo. *Former Attaché for Press and Cultural Affairs, Finnish Embassy, London.*

Lionel Salter. *Harpsichordist, pianist, and conductor. Assistant Controller of Music, British Broadcasting Corporation, London, 1967–74.*

Jeffrey L. Sammons. *Professor of German, Yale University.*

Claudio Sartori (d. 1994). *Chief, Office of Research and Indexing of the Italian Musical Funds, Braidense National Library, Milan.*

Angiola Sartorio. *Choreographer. Director of International Summer Dance School, Corona Del Mar, Calif. Former Head of the Dance Department, Sullins College, Bristol, Va.*

Tadao Sato. *Writer. Chairman, Japan Film P.E.N. Club. Author of Kurosawa Akira no sekai and others.*

Richard Anthony Sayce (d. 1977). *Fellow of Worcester College, Oxford; Reader in French Literature, University of Oxford.*

Byron Schaeffer, Jr. *Freelance writer.*

Aaron Scharf (d. 1993). *Professor of Art History, Open University, Milton Keynes, Eng., 1969–82.*

Jefim H. Schirmann (d. 1981). *Professor of Hebrew Literature, Hebrew University of Jerusalem.*

Paul Schlueter. *Writer, editor, and lecturer on literary topics.*

Laurence E. Schmeckebier. *Emeritus Professor of Fine Arts and Emeritus Dean, School of Art, Syracuse University, N.Y.*

Nancy Schmidt. *Freelance writer on African literature.*

Paul Waldo Schwartz. *Art Critic in Paris for The New York Times and Studio International. Author of The Sculptor in His Studio.*

Alexander Mackie Scott (d. 1989). *Reader in Scottish Literature, University of Glasgow.*

M.A. Screech. *Senior Research Fellow, All Souls College, University of Oxford. Fielden Professor of French Language and Literature, University College, University of London, 1971–84.*

Charles Scribner III. *Editor, Scribner, New York City.*

Humphrey Searle (d. 1982). *Composer. Professor of Composition, Royal College of Music, London.*

Nancy Seeger. *Freelance writer on visual arts.*

Edward G. Seidensticker. *Emeritus Professor of Japanese, Columbia University.*

William C. Seitz (d. 1974). *George R. Kenan, Jr., Professor of the History of Art, University of Virginia, Charlottesville, 1971–74.*

Charles Coleman Sellers. *Librarian, Dickinson College, Carlisle, Pa., 1956–68. Author of Charles Willson Peale and others.*

Jean Selz. *Art historian and critic. Member, International Association of Art Critics, Paris.*

Victor Ilyich Seroff (d. 1979). *Writer. Author of Rachmaninoff and others.*

Alexandrino E. Severino. *Professor of Portuguese, Vanderbilt University, Nashville, Tenn.*

Charles Seymour, Jr. (d. 1977). *Professor of the History of Art, Yale University, 1954–77.*

Isaac Avi Shapiro. *Honorary Fellow, Shakespeare Institute, University of Birmingham, Eng.; former Senior Lecturer in English.*

Claude L. Shaver. *Alumni Professor Emeritus of Speech, Louisiana State University, Baton Rouge.*

Donald Leslie Shaw. *Professor of Latin American Studies, University of Edinburgh.*

Wendy Stedman Sheard. *Art historian. Author of Antiquity in the Renaissance.*

John K.G. Shearman. *Professor of Fine Arts, Harvard University.*

Andrew Carrington Shelton. *Professor of Art History, University of Delaware, Newark.*

Sin-yan Shen. *President, Chinese Music Society of North America, Woodridge, Ill.*

David Julian Silverman. *Former Lecturer on Music, University of London.*

João Gaspar Simões. *Literary Critic, Diário de Notícias, Lisbon.*

Robert Simpson. *Composer. Music Producer, British Broadcasting Corporation, 1951–80.*

Denis Sinor. *Distinguished Professor Emeritus of Uralic and Altaic Studies and of History, Indiana University, Bloomington.*

Otto Skutsch (d. 1990). *Professor of Latin, University College, University of London, 1951–72.*

Nicolas Slonimsky (d. 1995). *Conductor, composer, writer, and editor. Lecturer in Music, University of California, Los Angeles, 1964–67. Editor, Baker's Biographical Dictionary of Musicians, 1949–93.*

F. Basil R. Smallman. *Alsop Professor Emeritus of Music, University of Liverpool.*

Arthur J(ames) M(arshall) Smith (d. 1980). *Professor of English and Poet-in-Residence, Michigan State University, East Lansing, 1960–72.*

Gilbert G. Smith. *Associate Professor of Spanish, North Carolina State University, Raleigh.*

Sheila Mary Smith. *Senior Lecturer in English, University of Nottingham, Eng.*

Whitney Smith. *Executive Director, Flag Research Center; Editor, The Flag Bulletin, Winchester, Mass.*

William Stevenson Smith (d. 1969). *Curator, Department of Egyptian Art, Museum of Fine Arts, Boston, 1956–69. Lecturer in Fine Arts, Harvard University, 1948–69.*

Craig Hugh Smyth. *Director, Villa I Tatti, Harvard Center for Italian Renaissance Studies, Florence; Professor of Fine Arts, Harvard University.*

The Rev. Kevin Smyth. *Former Professor of Scripture, Milltown Park, Dublin.*

M.R. Snodin. *Curatorial staff member, Department of Metalwork, Victoria and Albert Museum, London.*

Wilbert Snow (d. 1977). *Professor of English, Wesleyan University, Middletown, Conn., 1929–72.*

James E. Snyder (d. 1990). *Professor of Art History, Bryn Mawr College, Pa.*

David Sokol. *Professor of the History of Art and Architecture, University of Illinois at Chicago.*

Angelo Solmi. *Film critic, Oggi (weekly literary periodical). Former Managing Editor, Rizzoli Editore, Milan.*

Friedrich Solmsen (d. 1989). *Moses Slaughter Professor of Classical Studies, University of Wisconsin, Madison, 1962–74.*

Kathrine Sorley Walker. *Freelance writer, editor, and dance critic. Author of Dance and Its Creators and others.*

Brian C. Southam. *Publisher, Athlone Press, London. Author of Jane Austen's Literary Manuscripts and others.*

John Sparrow (d. 1992). *Warden of All Souls College, University of Oxford, 1952–77.*

George Speaight. *Former Editorial Director, George Rainbird Ltd. Author of The History of the English Puppet Theatre and others.*

Robert (William) Speaight (d. 1976). *Actor, biographer, critic, and fiction writer. Author of Life of Hilaire Belloc and others.*

Monroe K. Spears. *Moody Professor of English, Rice University, Houston, Texas.*

John R. Spencer (d. 1994). *Professor of Art, Duke University, Durham, N.C.*

Albert Sperisen. *Vice President in Charge of Production, Foote, Cone & Belding, San Francisco.*

Radcliffe Squires (d. 1993). *Poet. Professor of English, University of Michigan, Ann Arbor, 1963–81.*

William Bedell Stanford (d. 1984). *Chancellor, University of Dublin, 1982–84; Regius Professor of Greek, 1940–80.*

Jerry Stannard (d. 1988). *Professor of History, University of Kansas, Lawrence, 1967–88.*

Wolfgang Stechow (d. 1974). *Professor of Fine Arts, Oberlin College, Ohio, 1940–63.*

Richard G. Stern. *Helen A. Regenstein Professor of English, University of Chicago.*

Frederick William Sternfeld (d. 1994). *Reader in the History of Music, University of Oxford.*

Denis William Stevens. *President, Academia Monteverdiana. Professor of Musicology, Columbia University, 1964–76.*

Halsey Stevens (d. 1989). *Composer. Professor of Music, University of Southern California, Los Angeles, 1951–76.*

John I.M. Stewart (d. 1994). *Reader in English Literature, University of Oxford, 1969–73.*

Noel Stock. *Emeritus Professor of English, University of Toledo, Ohio.*

Göran Stockenström. *Professor and Chairman, Department of Scandinavian Studies, University of Minnesota, Minneapolis.*

Sewell Stokes (d. 1979). *Author and dramatist. Author of Isadora: An Intimate Portrait and others.*

Eric Stone (d. 1993). *Lecturer in Modern History, University of Oxford; Fellow and Tutor in Medieval History, Keble College, Oxford, 1955–91.*

Gleb Struve (d. 1985). *Professor of Slavic Languages and Literatures, University of California, Berkeley, 1947–67.*

Michael Sullivan. *Christensen Professor Emeritus of Oriental Art, Stanford University, Calif.*

Sir John Summerson (d. 1992). *Curator, Sir John Soane's House and Museum, London, 1945–84.*

Sir James R. Sutherland (d. 1996). *Professor of Modern English Literature, University College, University of London, 1951–67.*

Denys Sutton (d. 1991). *Editor, Apollo magazine, 1962–87. Art Critic, Financial Times. Author of The Art of James McNeill Whistler and others.*

Frederick A. Sweet. *Curator of American Painting and Sculpture, Art Institute of Chicago, 1952–68.*

Leslie Clifford Sykes. *Former Professor of French, University of Leicester, Eng.*

Jean-Guy Sylvestre. *National Librarian of Canada, Library of Parliament, Ottawa, 1968–83.*

Charles Johnson Taggart. *Freelance writer.*

Stanley Taikeff. *Playwright and poet.*

Michael Talbot. *Professor of Music, University of Liverpool.*

James S. Tassie. *Adjunct Professor of French, Carleton University, Ottawa.*

Allen Tate (d. 1979). *Poet and critic. Regents' Professor of English, University of Minnesota, Minneapolis, 1966–68.*

Abdallah at-Tayib. *Vice-Chancellor; Professor of Arabic, University of Khartoum, The Sudan.*

John Russell Taylor. *Art Critic*, The Times (London); *Film Critic*, 1962–73. *Professor of Cinema*, University of Southern California, Los Angeles, 1972–78.

Owen Reece Taylor (d. 1983). *Professor of French*, Queen Mary College, University of London, 1969–77.

Ronald Jack Taylor. *Professor of German*, University of Sussex, Brighton, Eng.

Walter Terry (d. 1982). *Dance critic and editor*, Saturday Review magazine; New York Herald Tribune; and others.

David Christopher Traherne Thomas. *Former Assistant Director of Art*, Arts Council of Great Britain, London. *Joint compiler of The First Hundred Years of the Royal Academy, 1769–1868 (catalog of Royal Academy Winter Exhibition, London, 1951–52).*

Lawrance R. Thompson (d. 1973). *Holmes Professor of Belles-Lettres*, Princeton University, 1968–73; *Professor of English*, 1951–73.

Friedrich Thöne (deceased). *Art historian. Author of Lucas Cranach der Ältere and others.*

Anthony Thwaite. *Poet and critic. Coeditor*, Encounter. *Author of Contemporary English Poetry and others.*

Marion Rose Tinling. *Coeditor of The Secret Diary of William Byrd of Westover and others.*

Ronald W. Tobin. *Associate Vice Chancellor and Professor of French*, University of California, Santa Barbara.

Joyce M.S. Tompkins (d. 1986). *Reader in English*, University of London, 1948–65.

Louis Tremaine. *Freelance writer on African literature.*

Brian Lewis Trowell. *King Edward Professor of Music*, King's College, University of London.

C.H. Truman. *Curatorial staff member*, Victoria and Albert Museum, London.

Constantine Athanasius Trypanis (d. 1993). *Minister of Culture and Science*, Government of Greece, 1974–77. *Professor of Classical Languages and Literatures*, University of Chicago, 1968–74.

Martin Turnell (d. 1979). *Writer. Head*, Programme Contracts Department, BBC, London, 1959–69.

Arlin Turner (d. 1980). *James B. Duke Professor of English*, Duke University, Durham, N.C., 1974–79.

Darwin T. Turner (d. 1991). *University of Iowa Foundation Professor of English*, University of Iowa, Iowa City, 1981–91; *Chairman*, African-American World Studies.

Vale Uibopuu. *Novelist. Editor*, Estonian Writers' Cooperative, Lund, Swed.

Vernon Philip Underwood (d. 1988). *Professor of French*, University College, University of London.

Dora Vallier. *Art critic. Author of Henri Rousseau: Catalogue raisonné de l'oeuvre; Henri Rousseau; and others.*

Norman Vance. *Senior Lecturer in English*, University of Sussex, Brighton, Eng.

Eugene Vanderpool (d. 1989). *Professor of Archaeology*, American School of Classical Studies at Athens, 1949–71.

Milos Velimirovic. *Professor of Music*, University of Virginia, Charlottesville.

Paul Viallaneix. *Emeritus Professor of French Literature*, University of Clermont-Ferrand, Fr.

Michele Vishny. *Art historian and critic. Contributor to Arts Magazine.*

Wolf Von Eckardt (d. 1995). *Design Critic*, Time magazine, 1981–85. *Architecture Critic*, The Washington Post, 1963–81.

Klaus Philipp Wachsmann. *Emeritus Professor of Music*, Northwestern University, Evanston, Ill.

John Wain (d. 1994). *Novelist, poet, and critic. Professor of Poetry*, University of Oxford, 1973–78.

Hugh Wakefield (d. 1984). *Keeper*, Department of Circulation, Victoria and Albert Museum, London, 1960–75.

Frank Walker (d. 1962). *Musicologist and broadcaster.*

David Harold Wallace. *Chief, Branch of Reference Services*, National Park Service, U.S. Department of the Interior, Harpers Ferry, W.Va., 1974–80.

Irving Wallace (d. 1990). *Novelist and biographer. Author of The Fabulous Showman: The Life and Times of P.T. Barnum; The Man; and many others.*

Francis James Warne. *Former Senior Lecturer in French*, University of Bristol, Eng.

Sir Ellis K. Waterhouse (d. 1985). *Director of Studies*, Paul Mellon Centre for Studies in British Art, London, 1970–73. *Barber Professor of Fine Arts*; *Director*, Barber Institute of Fine Arts, University of Birmingham, Eng., 1952–70.

Derek Watson. *Freelance writer and lecturer on music. Musical Director*, Traverse Theatre, Edinburgh, 1974–76.

Sir F.J.B. Watson (d. 1992). *Director of the Wallace Collection*, London, 1963–74. *Surveyor of the Queen's Works of Art*, 1963–72.

Gray Watson. *Senior Lecturer in History of Art*, Wimbledon School of Art, London.

Paul F. Watson. *Associate Professor of the History of Art*, University of Pennsylvania, Philadelphia.

Max Wehrli. *Professor of the History of German Literature*, University of Zürich.

Sharon Weiner. *Freelance writer.*

Stanley Weintraub. *Evan Pugh Professor of Arts and Humanities*, Pennsylvania State University, University Park.

John S. Weissmann. *Musicologist.*

David Welch. *Assistant Professor of Music*, Ramapo College, Mahwah, N.J.

Arthur Frederick Wells (d. 1966). *Praelector in Classics*, University College, University of Oxford.

James M. Wells. *Former Vice President and Custodian Emeritus*, John M. Wing Foundation on the History of Printing, Newberry Library, Chicago.

Enid Elder Hancock Welsford (d. 1981). *Lecturer in English*, University of Cambridge, 1923–59. *Author of The Court Masque; The Fool; and others.*

Francis William Wentworth-Sheilds (d. 1969). *Artist. Principal Lecturer*, Department of Printing and Graphic Design, Twickenham College of Technology, Middlesex, Eng., 1966–69.

Algot Werin (d. 1975). *Professor of Literature*, University of Lund, Swed.

Carroll W. Westfall. *Associate Professor of the History of Art and Architecture*, University of Illinois, Chicago.

Geoffrey Weston. *Editorial staff member*, The Times (London). *Former Senior Subeditor*, Country Life.

Sir Jack Allan Westrup (d. 1975). *Professor of Music*, University of Oxford, 1946–71; *Fellow of Wadham College*, Oxford, 1947–71.

Harold E. Wethey (d. 1984). *Professor of the History of Art*, University of Michigan, Ann Arbor, 1946–72.

Margaret Dickens Whinney (d. 1975). *Reader in the History of Art*, University of London, 1950–64.

D. Maxwell White. *Emeritus Professor of Italian Language and Literature*, University of Leeds, Eng.

David White. *Faculty member*, Department of Visual Arts, Trinity College, University of Dublin.

E.B. White (d. 1985). *Writer. Contributing Editor*, The New Yorker.

Dorothy Whitelock (d. 1982). *Elrington and Bosworth Professor of Anglo-Saxon*, University of Cambridge; *Fellow of Newnham College*, Cambridge, 1957–69.

John Humphreys Whitfield (d. 1995). *Serena Professor of Italian Language and Literature*, University of Birmingham, Eng., 1946–74.

Richard Whittingham. *Freelance writer.*

David S. Wiley. *Director, African Studies Program, Michigan State University, East Lansing.*

John Ritchie Wilkie. *Emeritus Professor of German, University of Aberdeen, Scot.*

Frank Willett. *Honorary Senior Research Fellow, Hunterian Museum and Art Gallery, University of Glasgow; Director and Titular Professor, 1976-90.*

John William Mills Willett. *Writer and editor. Planning Editor, The Times (London) Literary Supplement, 1969-71.*

Basil Willey (d. 1978). *King Edward VII Professor of English Literature, University of Cambridge, 1946-64.*

Geoffrey Wills. *Freelance writer on antiques. Author of "Automata" in The Concise Encyclopedia of Antiques.*

Marjorie Winters. *Freelance writer on African literature.*

William Witte (d. 1992). *Professor of German, University of Aberdeen, Scot., 1951-77.*

Rudolf Wittkower (d. 1971). *Professor of the History of Art, Columbia University, 1956-68.*

Friedrich Wilhelm Wodtke (d. 1973). *Professor of German Literature, Kiel University, W.Ger., and Athens University, Greece.*

Mary Woodall (d. 1988). *Director, City Museum and Art Gallery, Birmingham, Eng., 1956-64.*

George Woodcock (d. 1995). *Editor, Canadian Literature (quarterly), University of British Columbia, Vancouver, 1959-77.*

Raymond Bernard Wood-Jones. *Reader in Architecture, Victoria University of Manchester.*

John E. Woods. *Professor of Middle Eastern History, University of Chicago.*

John Woodward (d. 1988). *Keeper, Birmingham City Museum and Art Gallery, Eng.*

Edward J. Wormley. *Products and interior designer. Former Design Director, Dunbar Furniture Corporation of Indiana, New York City.*

Robert M. Wren. *Professor of English, University of Houston, Texas.*

Stephen Graham Wright. *Former Adviser at the National Library of Ethiopia and at Haile Selassie I University, Addis Ababa.*

Patrick Maurice Yarker. *Former Senior Lecturer in English Literature, King's College, University of London.*

Philip Young (d. 1991). *Evan Pugh Professor of English, Pennsylvania State University, University Park, 1980-88.*

Nicolas M. Zernov (d. 1980). *Spalding Lecturer in Eastern Orthodox Culture, University of Oxford, 1947-66.*

Vladimir Viktorovich Zhdanov (deceased). *Literary critic. Assistant to the Chief Editor, Kratkaya Literaturaya Entsiklopediya, Moscow.*

Leon M. Zolbrod. *Former Professor of Asian Studies, University of British Columbia, Vancouver.*

Part Seven. Technology

Samuel Roy Aldrich. *Emeritus Professor of Agronomy, University of Illinois at Urbana-Champaign.*

Robert Theodore Alexander. *Captain, U.S. Coast Guard (retired); former Chief, Civil Engineering Division, U.S. Coast Guard Headquarters, Washington, D.C.*

Bruce E. Anderson. *Former Head, (gun) Propellant Research, U.S. Army Ordnance, Research and Development Division.*

Joseph Chapman Anderson. *Former Professor of Electrical Materials, Imperial College of Science and Technology, University of London.*

Walter Harry Green Armytage. *Emeritus Professor of Education, University of Sheffield, Eng. Author of A Social History of Engineering.*

A. Richard Baldwin. *Vice President and Executive Director of Research, Cargill, Inc., Minneapolis, Minn., 1964-83.*

Stanley S. Ballard. *Emeritus Professor of Physics, University of Florida, Gainesville.*

Karl A. Bauer (deceased). *President, Carl Zeiss, Inc., New York City.*

Sir Frederick Charles Bowden (d. 1972). *Director of Rothamsted Experimental Station, Harpenden, Eng., 1958-72.*

Roy E. Beal. *Former Manager, Welding Research, Illinois Institute of Technology Research Institute, Chicago.*

Jesse W. Beams (d. 1977). *Professor of Physics, University of Virginia, Charlottesville, 1930-69.*

T. Keilor Bentley. *Director, Owens Art Gallery, Mount Allison University, Sackville, N.B., 1976-89. Superintendent, Alexander Graham Bell Museum, Baddeck, N.S., 1959-64.*

Don H. Berkebile. *Associate Curator, Division of Transportation, Smithsonian Institution, Washington, D.C., 1974-81.*

Henry H. Billings (d. 1987). *Freelance writer, illustrator, and mural painter. Author of Bridges and others.*

Raymond C. Binder (d. 1978). *Professor of Mechanical Engineering, University of Southern California, Los Angeles, 1960-78.*

Orlan William Boston (d. 1991). *Professor of Mechanical and Production Engineering, University of Michigan, Ann Arbor, 1951-56.*

John Boyd. *Manager, Bearings and Lubrication Section, Westinghouse Electric Corporation, Pittsburgh, 1945-67.*

John E. Brekke. *Former Head, Hawaii Fruit Laboratory, U.S. Department of Agriculture, University of Hawaii, Honolulu.*

Benjamin Arthur Brock. *Director and Factory Manager, Brock's Fireworks Ltd., England.*

Matthew Joseph Bruccoli. *Jefferies Professor of English, University of South Carolina, Columbia.*

Nelson Hitchcock Budd. *Former Information and Public Relations Director, National Canners Association.*

Willem Burger. *Former Senior Lecturer in Maritime Studies, University of Wales Institute of Science and Technology, Cardiff.*

Thomas Burnett. *Research Officer, Ottawa Research Station, Canada Department of Agriculture.*

Henry R. Clauser. *Consultant, Materials Engineering magazine; Editor-Publisher, 1965-69; Editor, 1958-64; Associate Editor and Managing Editor, 1946-57.*

Donald George Coleman. *Compiler, Computerized Information Retrieval System, Wood Science and Forest Products Journal, Forest Products Research Society, Madison, Wis.*

John Paul Comstock. *Former Naval Architect, Newport News Shipbuilding and Dry Dock Company, Va.*

Grace Rogers Cooper. *Museum consultant. Curator, Division of Textiles, Smithsonian Institution, Washington, D.C., 1946-76.*

André George Corbet. *Lecturer in Maritime Studies, University of Wales College of Cardiff.*

Edwin Alfred Course. *Former Senior Lecturer in Adult Education, University of Southampton, Eng. Author of London Railways.*

Alden S. Crafts (d. 1990). *Professor of Botany, University of California, Davis, 1946-64.*

Daniel B. Dallas. *Editorial Director, Society of Manufacturing Engineers, Dearborn, Mich.; Editor in Chief, The Tool and Manufacturing Engineers Handbook.*

Milton Rockwood Daniels (deceased). *Commodore, U.S. Coast Guard.*

C.W. Dannatt (d. 1962). *Professor, Royal School of Mines, University of London.*

Donald de Carle. *Author of Horology; Practical Watch Repairing; and many others.*

Nigel T.M. Dennis. *Technical Manager, Edwards High Vacuum (Division of BOC Ltd.), Crawley, Eng.*

Charles Dollfus (d. 1981). *Aeronautical historian. Founder and Director, Museum of the Air, Paris.*

Francis Donaldson (d. 1970). *Vice President, Mason & Hanger—Silas Mason, Inc., New York City. Author of Practical Shaft sinking.*

George Dubpernell. *Consultant, M & T Chemicals Inc., Southfield, Mich.; technical adviser, 1955–66.*

Peter Duff. *Former Editor, The Shipping World, London.*

LeRoy Dugan. *Emeritus Professor of Food Science, Michigan State University, East Lansing.*

Frederick C. Durant III. *Aerospace historian. Assistant Director, Astronautics, National Air and Space Museum, Smithsonian Institution, Washington, D.C., 1965–81.*

Ernst R.G. Eckert. *Regents' Professor Emeritus of Mechanical Engineering, University of Minnesota, Minneapolis; Director, Thermodynamics and Heat Transfer Division, 1955–73.*

John F. Elliott (d. 1991). *Professor of Metallurgy, Massachusetts Institute of Technology, Cambridge, 1960–91.*

Victor A. Endersby. *Consulting civil engineer.*

Barbara Ensrud. *Writer and editor on food and wine.*

Daniel Snell Eppelsheimer (d. 1988). *Professor of Metallurgical and Nuclear Engineering, University of Missouri, Rolla, 1947–78.*

Valeska Evertsbusch. *Former Biochemist and Technical Editor, Biomedical Research Division, Lawrence Radiation Laboratory, University of California, Livermore.*

Gordon Maskew Fair (d. 1970). *Abbott and James Lawrence Professor of Engineering; Gordon McKay Professor of Sanitary Engineering, Harvard University.*

Raymond E. Fielding. *Dean, School of Motion Picture, Television and Recording Arts, Florida State University, Tallahassee.*

Gerald Reginald Mansel Garratt (d. 1989). *Keeper, Department of Aeronautics and Marine Transport, Science Museum, London, 1966–71.*

Wesley Patterson Garrigus. *Emeritus Professor of Animal Husbandry, University of Kentucky, Lexington.*

Alan H. Gayfer. *Editorial consultant and technical adviser, Cycling World, London. Editor, Cycling, 1964–69.*

Lucien Albert Gerardin. *Research Director, Future Studies, Groupe Thomson, Paris.*

Frank Gerrard. *President, Institute of Meat, London, 1960–62. Head of Department, National College of Food Technology, Smithfield, London, 1947–61.*

George Sweet Gibb. *Former Director of Communications, Balfour Company, Attleboro, Mass.*

Charles Harvard Gibbs-Smith (d. 1981). *Research Fellow, Science Museum, London, 1976–81. Keeper, Public Relations and Education Department, Victoria and Albert Museum, London, 1947–71.*

Keith Reginald Gilbert (d. 1973). *Keeper, Department of Mechanical and Civil Engineering, Science Museum, London.*

John B. Gordon (d. 1964). *Secretary, Bureau of Raw Materials for American Vegetable Oils and Fats Industries, Washington, D.C.*

Linton E. Grinter (d. 1993). *Dean, Graduate School, University of Florida, Gainesville, 1952–69; Executive Vice President, 1969–70. Author of Design of Modern Steel Structures and others.*

Harold James Grossman (d. 1967). *Marketing consultant on beverages. Author of Grossman's Guide to Wines, Spirits and Beers and others.*

Hagiwara Takahiro. *Emeritus Professor of Earthquake Research Institute, University of Tokyo.*

Andrew Edward Hahn. *Former Managing Editor, Quality of Sheffield, Sheffield, Eng.*

Robert W. Hamilton. *Consultant in environmental physiology. Research Supervisor, Research and Development Laboratory, Ocean Systems, Inc., Tarrytown, N.Y., 1969–74.*

Stanley Baines Hamilton. *Chartered civil and structural engineer. Writer and editor on engineering history.*

Francis Hamit. *Freelance writer.*

Carl Hanson (d. 1985). *Pro-Vice-Chancellor; Professor of Chemical Engineering, University of Bradford, Eng.*

Wayne V. Harsha (d. 1992). *Editor, Inland Printer/American Lithographer, 1951–70; Executive Editor, 1970–75.*

Richard S. Hartenberg. *Emeritus Professor of Mechanical Engineering, Northwestern University, Evanston, Ill.*

Alden Hatch (d. 1975). *Novelist, biographer, and historian. Author of Remington Arms in American History and others.*

John M. Hayes. *Emeritus Professor of Structural Engineering, Purdue University, West Lafayette, Ind.*

John F. Hayward (d. 1983). *Associate Director, Sotheby Parke-Bernet and Company, London and New York City. Deputy Keeper, Victoria and Albert Museum, London, 1946–65.*

Phyllis West Heathcote (d. 1990). *Paris fashion editor, The Guardian (Manchester), 1946–68.*

John B. Heffernan (d. 1978). *Rear Admiral, U.S. Navy. Secretary, Naval Historical Foundation, Washington, D.C. Director of Naval History, Navy Department, 1946–56.*

Philip Heiberger. *Research Associate, E.I. du Pont de Nemours & Company, Inc., Philadelphia, 1976–83.*

Russell W. Henke. *Consulting engineer. Education Consultant, Institute for Fluid Power Education.*

David Himmelfarb. *Former Superintendent, U.S. Navy Ropewalk, Boston Naval Shipyard, Charlestown, Mass.*

Frederick Anthony Holland. *Professor and Chairman, Department of Chemical Engineering, University of Salford, Eng. Partner in Saldrem Associates (consulting chemical engineers).*

Solomon Cady Hollister (d. 1982). *Professor of Civil Engineering, Cornell University, Ithaca, N.Y.; Dean of Engineering, 1937–59.*

W.E. Howland (deceased). *Professor of Sanitary Engineering, Purdue University, West Lafayette, Ind.*

Inez Whitaker Hunt (d. 1983). *Lecturer and freelance writer. Teacher of creative writing, University of Colorado, Colorado Springs, 1963–66.*

John Cyril Herbert Hurd. *Textiles consultant. Former Head, School of Textiles, Leicester College of Technology and Commerce, Eng.*

William G. Ibberson. *Chairman, Sheffield Testing Works Ltd. and Sheffield Assay Office, Eng. Former Chairman, George Ibberson and Company Ltd., Sheffield, Eng.*

Miles Hopkins Imlay. *Rear Admiral (retired), U.S. Coast Guard.*

William Thorton Innes (d. 1969). *Founder and Director, Typothetae Printing Trade School, Philadelphia.*

Emerson C. Itschner. *Lieutenant General, U.S. Army (retired); Chief of Engineers, U.S. Army Corps of Engineers, 1956–61.*

Jules Janick. *James Troop Distinguished Professor of Horticulture, Purdue University, West Lafayette, Ind.*

S. Paul Johnston (d. 1985). *Director, National Air and Space Museum, Smithsonian Institution, Washington, D.C., 1964–69.*

C. Clyde Jones. *Emeritus Professor of Management, Kansas State University, Manhattan.*

Brewster Kahle. *President, WAIS Inc. (Wide Area Information Servers), Menlo Park, Calif.*

Sidney Karin. *Professor of Computer Science and Engineering; Director, Office of Advanced Scientific Computing, University of California, San Diego, at La Jolla.*

Ralph Kenyon Kilbon. *Director, Creative Services, RCA Corporation, New York City.*

Peter W. Kingsford. *Tutor, Extra Mural Department, University of London. Author of Engineers, Inventors, and Workers.*

Rudolf Kingslake. *Emeritus Professor of Optics, University of Rochester. Director of Optical Design, Eastman Kodak Company, Rochester, N.Y., 1939–69.*

D.C. Kiplinger (deceased). *Professor of Horticulture, Ohio State University, Columbus.*

Arthur Koehler (d. 1967). *Chief, Division of Silvicultural Relations, Forest Products Laboratory, U.S. Forest Service, 1927–48. Lecturer, School of Forestry, Yale University, 1951–53.*

Dietrich Küchemann (d. 1976). *Consultant, Aerodynamics Department, Royal Aircraft Establishment, Farnborough, Eng.; Head of Department, 1966–71.*

George Lang. *Restaurateur. Contributor to Gourmet, Town & Country, and Travel Holiday magazines.*

Pierre de Latil. *Scientific Editor, Le Figaro, Paris. Coauthor of Le Professeur Auguste Piccard and others.*

Mildred K. Lehman. *Researcher on This High Man: The Life of Robert H. Goddard.*

Milton Lehman (d. 1966). *Freelance writer. Author of This High Man: The Life of Robert H. Goddard.*

Hellmut E. Lehmann-Haupt (d. 1992). *Professor of Bibliography and Rare Book Consultant, University of Missouri, Columbia, 1969–75.*

Irwin Solomon Lerner. *President, Lerner Laboratories, New Haven, Conn.*

Lawrence P. Lessing. *Member, Board of Editors, Fortune magazine, New York City, 1941–52; 1965–74.*

Donald S. Lopez. *Chairman, Department of Aeronautics, National Air and Space Museum, Smithsonian Institution, Washington, D.C.*

Carleton Mabree. *Emeritus Professor of History, State University of New York College at New Paltz.*

Alexander McDonald (d. 1968). *Secretary, The Institution of Civil Engineers, London, 1954–67.*

James McDonald. *Freelance writer.*

Fred Devereux McHugh. *Editor for the Office, Chief of Ordnance (Army), Washington, D.C.*

Donald LeCrone McMurry. *Author of The Great Burlington Strike of 1888 and others.*

L. Andrew Mannheim (d. 1990). *Technical editor, writer, and consultant. Author of Leica Way and others; editor of Focal Encyclopedia of Photography.*

Clarence Thomas Marek. *Emeritus Professor of Metal Processing, Purdue University, West Lafayette, Ind.*

Robert W. Marks (d. 1993). *Writer and editor. Lecturer in Philosophy, New School for Social Research, New York City.*

George Peterkin Meade (d. 1975). *Vice President, International Commission for Uniform Methods of Sugar Analysis. Manager, Colonial Sugars Company, Gramercy, La., 1928–56.*

John Lawrence Mero. *President, Ocean Resources, Inc., La Jolla, Calif.*

Jeannette Mirsky (d. 1987). *Visiting Fellow, Department of East Asian Studies, Princeton University, 1970–74. Coauthor of The World of Eli Whitney.*

Malcolm Monroe (d. 1988). *Vice President, Monroe Calculating Machine Company, Orange, N.J.*

John D. Moorhead. *Freelance writer on military and technical subjects.*

James Charles Moran. *Former Editor, Graphic Technology (London).*

Dave Calvin Mote. *Freelance writer.*

Michael James Moylan. *Director, Moylubes Ltd., Farnham, Eng.*

William Alvin Mudge. *Assistant to the President, International Nickel Company, Inc., New York City, 1955–58; Director, Technical Service, 1947–55.*

Jerry A. Nathanson. *Professor of Engineering, Union County College, Cranford, N.J.*

Herbert Lownds Nichols, Jr. *Publisher, Greenwich, Conn. Author of Moving the Earth and others.*

St. John Cousins Nixon. *Author of The Invention of the Automobile; Wolseley: A Saga of the Motor Industry; and others.*

Richard Marian Ogorkiewicz. *Professor, Royal Military College of Science, Cranfield University, Shrivenham, Eng.*

William David Ollis. *Professor of Organic Chemistry, University of Sheffield, Eng.*

Christabel Susan Orwin. *Coauthor of The Open Fields; History of British Agriculture, 1846–1914.*

A.S. Osley (d. 1987). *Head of Naval Scientific Administration Department, Ministry of Defence, United Kingdom.*

Robert P. Pace. *Account Executive, R. Hoe & Company, Inc., New York City.*

John Bingham Parkinson. *Former Chief, Aerodynamics, Aeronautical Vehicles, National Aeronautics and Space Administration, Washington, D.C.*

John W. Parry (d. 1976). *Author of Spices; The Spice Handbook.*

Harold Leslie Peterson (d. 1978). *Chief Curator, National Park Service, U.S. Department of the Interior, 1964–77. Author of Arms and Armor in Colonial America, 1526–1783 and others.*

William G. Pfann (d. 1982). *Department Head, Materials Research Laboratory, Bell Telephone Laboratories, Inc., Murray Hill, N.J.*

Jack Pickthall. *Consultant to International Flavours and Fragrances Ltd., Enfield, Eng. Former President, Society of Cosmetic Chemists, Great Britain, and British Society of Perfumers.*

Norman C. Polmar. *Consultant. Editor, U.S. sections, Jane's Fighting Ships, 1967–77.*

John Bell Rae (d. 1988). *Professor of the History of Technology, Harvey Mudd College, Claremont, Calif., 1959–76.*

Deborah Robbins. *Freelance writer.*

L.T.C. Rolt (d. 1974). *Member, Executive Committee, American Society for the History of Technology. Chairman, Talylyn Railway Company, England, 1963–68.*

John Kerr Rose (d. 1974). *Senior Specialist in Natural Resources and Conservation, Library of Congress, 1955–73.*

Richard D. Ross. *Eastern Area Manager, Chemical Waste Management, Inc., Norristown, Pa.*

Hunter Rouse (d. 1996). *Carver Professor of Hydraulics, University of Iowa, Iowa City, 1972–74; Dean, College of Engineering, 1966–72.*

Michel Rouzé. *Former producer in French broadcasting. Author of Robert Oppenheimer: The Man and His Theories.*

Charles R. Russell. *Former Professor of Mechanical Engineering, California Polytechnic State University, San Luis Obispo.*

Sir (Edward) John Russell (d. 1965). *Director, Rothamsted Experimental Station, Harpenden, Eng., 1912–43.*

Norman Leonard Samways. *Technical Editor, Association of Iron and Steel Engineers, Pittsburgh.*

Harold Eugene Saunders (d. 1961). *Captain, U.S. Navy; Technical Assistant to Chief of Bureau of Ships, Navy Department.*

James Patrick Saville. *Former Manager, Information Services, The Metals Society, London.*

Julian L. Schueler (d. 1962). *Consultant, Continental Steel Corporation, Kokomo, Ind.*

Bernard Sylvester Schweigert. *Professor and Chairman, Department of Food Science and Technology, University of California, Davis.*

Donald Shannon. *Former Manager, Public Relations Department, Otis Elevator Company, New York City.*

Mitchell R. Sharpe. *Science writer and rocketry historian. Author of Living in Space: The Astronaut and His Environment and others.*

Orson Cutler Shepard. *Emeritus Professor of Metallurgy, Stanford University, Calif.*

Charles Ely Rose Sherrington. *Secretary, British Railways Research Service, 1924–62.*

Thomas Mortimer Simmons. *Former Deputy Keeper, Department of Transport and Mining, Science Museum, London.*

Herbert A. Simon. *Richard King Mellon University Professor of Computer Science and Psychology, Carnegie Mellon University, Pittsburgh. Nobel Prize for Economics, 1978.*

Alec Westley Skempton. *Emeritus Professor of Civil Engineering, Imperial College of Science and Technology, University of London.*

Albert Lewis Slover. *Former Technical Assistant to the Chief, Naval Engineering Division, U.S. Coast Guard.*

F.D. Smith. *Manager, University Development, Research and Engineering Division, Monsanto Chemical Company, St. Louis, Mo., 1956–63.*

Reginald Leslie Smith-Rose (d. 1980). *Secretary-General, Inter-Union Commission on Frequency Allocations for Radio Astronomy and Space Science, 1961–73. Director, Radio Research, Department of Scientific and Industrial Research, London, 1948–60.*

Edward W. Smykay. *Professor and Chairman, Department of Marketing, University of Baltimore.*

Harry J. Solberg. *Director of Corporate Planning, American Express Company. Former Associate Professor of Commerce, University of Wisconsin, Madison.*

Hereward Philip Spratt. *Deputy Keeper, Science Museum, London, 1930–67.*

Anthony Standen (d. 1993). *Executive Editor, Kirk-Othmer Encyclopedia of Chemical Technology, New York City, 1963–70.*

Joshua Stern. *Lecturer in Physics, University of Maryland, College Park. Associate Editor, Review of Scientific Instruments.*

Robert E. Stewart (deceased). *Distinguished Professor of Agricultural Engineering, Texas A&M University, College Station, 1968–80.*

Arthur Stowers (d. 1977). *Keeper, Department of Mechanical and Civil Engineering, Science Museum, London, 1950–62.*

George R. Strakosch. *Associate, Jaros, Baum and Bolles (consulting engineers), New York City. Former Manager, Elevators, General Sales, Otis Elevator Company, New York City.*

Frank Whitworth Stubbs, Jr. (d. 1967). *Professor of Civil Engineering, Purdue University, West Lafayette, Ind.*

Charles Süsskind. *Emeritus Professor of Engineering Science, University of California, Berkeley.*

Harry C. Thomson. *Former Chairman, Political Science Department, DePaul University, Chicago. Assistant Editor, Encyclopædia Britannica, Chicago, 1959–66.*

Samuel Tolansky (d. 1973). *Professor of Physics, Royal Holloway College, University of London, 1947–73.*

Forrest Glenn Tucker (deceased). *Emeritus Professor of Physics, Oberlin College, Ohio, 1926–60.*

William Arthur Vine (d. 1966). *Professor and Head, Department of Mining Engineering, Montana College of Mineral Science and Technology.*

Francis Walley. *Consulting Engineer. Under Secretary, Director of Civil Engineering Development, Department of the Environment, London, 1973–78.*

J. Garth Watson (d. 1992). *Secretary, Institution of Civil Engineers, London, 1967–79.*

Leon H. Weaver. *Former Professor of Criminal Justice, Michigan State University, East Lansing.*

Frederick Victor Wells. *Former Editor, Soap, Perfumery and Cosmetics, London. Founder-President, Society of Cosmetic Chemists of Great Britain.*

Charles S. Whewell (d. 1995). *Professor of Textile Industries, University of Leeds, Eng., 1963–77.*

Theodore J. Williams. *Professor of Engineering; Director, Purdue Laboratory for Applied Industrial Control, Purdue University, West Lafayette, Ind.*

Harold Francis Williamson. *Professor of Economics, Northwestern University, Evanston, Ill., 1948–69. Author of Winchester: The Gun That Won the West.*

George Bulkeley Laird Wilson. *Former Deputy Keeper, Department of Mechanical and Civil Engineering, Science Museum, London.*

Mitchell Wilson (d. 1973). *Science writer and novelist. Author of American Science and Invention and others.*

Melville Lawrence Wolfrom (d. 1969). *Regents' Professor of Chemistry, Ohio State University, Columbus, 1965–69.*

Ellen Louise Young. *Historical research specialist (manufactures).*

R. Eric Young. *Consultant in high technology systems engineering and instrumentation.*

Lev Zetlin (d. 1992). *President, Zetlin-Argo Structural Investigations, Inc., New York City, 1983–92.*

Part Eight. Religion

Nigel James Abercrombie (d. 1986). *Chief Regional Adviser, Arts Council of Great Britain, London, 1968–73; Secretary-General, 1963–68.*

Charles Joseph Adams. *Emeritus Professor of Islāmic Studies, McGill University, Montreal.*

The Rev. Joseph Denis Agius, O.S.B. *Monk of Downside Abbey, England.*

Sister Consuelo Maria Aherne. *Professor of History, Chestnut Hill College, Philadelphia. Assistant Staff Editor for Mediaeval Church History; Contributor to the New Catholic Encyclopedia.*

Sydney Eckman Ahlstrom (d. 1984). *Professor of Modern Religious History and American History, Yale University, 1964–83.*

Kurt Aland. *Professor of Church History, University of Münster, Ger.*

Hamilcar S. Alivisatos (d. 1969). *State Procurator of the Holy Synod of the Church of Greece. Professor of Canon Law and Pastoral Theology, University of Athens, 1918–56.*

The Rev. Michel Adrien Allard, S.J. (d. 1976). *Director, Institute of Oriental Studies, St. Joseph University, Beirut.*

The Rev. Arthur MacDonald Allchin. *Director, St. Theosevia Centre for Christian Spirituality, Oxford, Eng. Honorary Canon of Canterbury Cathedral.*

Robert W. Allison. *Former Manuscript Research Specialist, Department of Special Collections, University of Chicago Library.*

Jocelyn S. Almond. *Freelance writer. Coauthor of Understanding Tarot and others.*

The Rev. Anselm H. Amadio. *Chaplain; Instructor in Philosophy, Illinois Institute of Technology, Chicago. Staff Writer, Philosophy and Religion, Encyclopædia Britannica, Chicago, 1970–73.*

Milton Vasil Anastos. *Emeritus Professor of Byzantine Greek and History, University of California, Los Angeles.*

The Rev. George Wishart Anderson, D.D. *Professor of Hebrew and Old Testament Studies, University of Edinburgh, 1968–82.*

William Scovil Anderson. *Professor of Latin and Comparative Literature, University of California, Berkeley.*

Zafar Ishaq Ansari. *Former Professor of History, University of Petroleum and Minerals, Dhahran, Saudi Arabia.*

Michio Araki. *Professor of Asian Studies, Tokyo Science University.*

Henri Arvon. *Professor, University of Paris X.*

Max Arzt (d. 1975). *Vice-Chancellor, Jewish Theological Seminary of America, New York City, 1951–75.*

Donald Attwater (d. 1977). *Author of Penguin Dictionary of Saints; St. John Chrysostom, Pastor and Preacher.*

Roger-François-Marie Aubert. *Emeritus Professor of Church History, Catholic University of Louvain, Belg.*

Peter William Avery. *Former Lecturer in Persian, University of Cambridge; Fellow of King's College, Cambridge.*

Roland H. Bainton (d. 1984). *Titus Street Professor of Church History, Yale University, 1936–62.*

The Rev. Msgr. Joseph W. Baker. *Former Officialis, Archdiocese of Saint Louis, Mo.*

Ernst Bammel (d. 1996). *Reader in Early Christian and Jewish Studies, University of Cambridge.*

The Rev. Wade Crawford Barclay (d. 1965). *Historian, Board of Missions, Methodist Church, New York City.*

The Rt. Rev. Msgr. John Mackintosh Tilney Barton (d. 1977). *Priest-in-Charge, SS. Peter and Edward, London, 1950–75. English Consultor, Pontifical Biblical Commission.*

František M. Bartoš (d. 1972). *Professor of Church History, Comenius Protestant Theological Faculty, Prague.*

Robert Pierce Beaver (d. 1987). *Professor of Missions, Divinity School, University of Chicago, 1955–71.*

The Very Rev. Msgr. Henry G.J. Beck. *Emeritus Professor of Church History, Immaculate Conception Seminary, Darlington, N.J.*

Alfons Becker. *Professor of Medieval History, Johannes Gutenberg University of Mainz, Ger.*

David Ben-Gurion (d. 1973). *Prime Minister and Minister of Defense, government of Israel, 1948–53, 1955–63.*

The Rev. John C. Bennett (d. 1995). *President, Union Theological Seminary, New York City, 1963–70.*

Manfred Bensing. *Emeritus Professor of History, University of Leipzig.*

Alan Lewis Berger. *Former Instructor in Religion, Miami University, Oxford, Ohio.*

Reginald Robert Betts (d. 1961). *Masaryk Professor of Central European History, University of London, 1946–61.*

The Rev. Maurice Bévenot, S.J. (d. 1980). *Professor of Ecclesiology, Heythrop College, University of London.*

Stephen Beyer. *Freelance writer.*

Agehananda Bharati (d. 1991). *Professor of Anthropology, Syracuse University, N.Y., 1961–91.*

Jean Elfride Bickersteth. *Former Lecturer in Theology, University of Hull, Eng.*

Ludwig G.J. Bieler (d. 1981). *Professor of Palaeography and Late Latin, University College, Dublin, National University of Ireland.*

The Rev. Anselm Gordon Biggs, O.S.B. *Professor of History, Belmont Abbey College, N.C.*

Katharine Bird. *Freelance writer on religion.*

The Rev. Robert L. Bireley, S.J. *Professor of History, Loyola University, Chicago.*

The Rev. Nicholas Frederick Bisheimer, S.V.D. (d. 1966). *President, Society of the Divine Word, Western Province.*

Ernst Bizer (d. 1975). *Professor of Church History, Rhenish Friedrich Wilhelm University of Bonn.*

William Barnett Blakemore (d. 1975). *Professor of Ecumenical Christianity, 1971–75; Dean, Disciples Divinity House, University of Chicago.*

Sheldon H. Blank (d. 1989). *Professor of Bible, Hebrew Union College–Jewish Institute of Religion, Cincinnati, Ohio, 1926–78.*

Edwin Boardman (d. 1968). *Professor of Church History and Senior Counselor, Ashland Theological Seminary, Ohio.*

Pieter Arie Hendrik de Boer (d. 1989). *Professor of Old Testament, State University of Leiden, Neth., 1938–78.*

Rabbi Ben Zion Bokser (d. 1984). *Rabbi, Forest Hills Jewish Center, Forest Hills, N.Y. Adjunct Professor of Political Science, Queens College, City University of New York.*

Arthur Stanley Bolster, Jr. *Emeritus Professor of Education, Harvard University.*

Gerald Bonner. *Emeritus Reader in Theology, University of Durham, Eng. Distinguished Professor of Early Christian Studies, Catholic University of America, Washington, D.C., 1991–94.*

The Rev. William Joseph Bosch, S.J. *Associate Professor of History, LeMoyné College, Syracuse, N.Y.*

Carroll Julian Bourg. *Professor of Sociology, Fisk University, Nashville, Tenn.*

The Rev. Charles Samuel Braden (d. 1970). *Resident Scholar, Perkins School of Theology, Southern Methodist University. Professor of History and Literature of Religions, Northwestern University, Evanston, Ill., 1943–54.*

The Rev. Ignatius Charles Brady, O.F.M. *Director of the theological section, College of St. Bonaventura, Grottaferrata, Italy, 1961–82.*

Paul Breidenbach. *Associate Professor of Anthropology, Loyola University, Chicago.*

The Rev. Keith Richard Bridston. *Executive Director, New York City office, World Council of Churches, 1978–84.*

John Bright (d. 1995). *Professor of Hebrew and the Interpretation of the Old Testament, Union Theological Seminary, Richmond, Va., 1940–43; 1946–75.*

Harmon Hartzell Bro. *Codirector, Pilgrim Institute, Clinton, Wash.*

The Rev. John Francis Broderick, S.J. *Emeritus Professor of Church History, Weston School of Theology, Cambridge, Mass.*

The Rev. James Patrick Brodrick, S.J. *Author of Origin of the Jesuits and others.*

Geoffrey W. Bromiley. *Emeritus Professor of Church History and Historical Theology, Fuller Theological Seminary, Pasadena, Calif.*

The Rev. Victor John Knight Brook (d. 1974). *Fellow of All Souls College, Oxford, 1938–59; Lecturer in Reformation Theology, University of Oxford, 1929–34.*

Christopher Nugent Lawrence Brooke. *Dixie Professor of Ecclesiastical History, University of Cambridge.*

Peter R.L. Brown. *Rollins Professor of History, Princeton University.*

Frederick Fyvie Bruce (d. 1990). *Rylands Professor of Biblical Criticism and Exegesis, Victoria University of Manchester, 1959–78.*

The Rev. Joseph Stanislaus Brusher, S.J. (d. 1972). *Professor of History, University of San Francisco, 1968–72.*

The Rev. Erwin Buck. *Pastor, St. Peter Lutheran Church, Medicine Hat, Alberta.*

Robert J. Buck. *Professor of Classics, University of Alberta, Edmonton.*

J.A.B. van Buitenen (d. 1979). *Distinguished Service Professor of Sanskrit and Indic Studies, University of Chicago, 1974–79.*

The Rev. Sebastian Bullough, O.P. (d. 1967). *Lecturer in Hebrew, University of Cambridge.*

The Rev. Walter John Burghardt, S.J. *Senior Fellow, Woodstock Theological Center, Georgetown University, Washington, D.C.*

The Rev. Ernest Joseph Burrus, S.J. *Historian of Jesuit Order, Jesuit Historical Institute, Rome, Italy, and St. Louis, Mo.*

Harold Butcher. *Freelance writer.*

- Theodore Vern Buttrey, Jr.** *Former Professor of Classics, University of Michigan, Ann Arbor.*
- Charles Robert Byrnes.** *Former Executive Director, International Association of Auditorium Managers, Chicago Heights, Ill.*
- The Rev. William James Byron, S.J.** *President, Catholic University of America, Washington, D.C.*
- Henry J. Cadbury** (d. 1974). *Hollis Professor of Divinity, Harvard University, 1934–54. Chairman, American Friends Service Committee, 1928–34; 1944–60.*
- The Rev. Carnegie Samuel Calian.** *President and Professor of Theology, Pittsburgh Theological Seminary.*
- Mother Louise Callan, R.S.C.J.** (d. 1966). *Professor of History, Maryville College of the Sacred Heart, St. Louis, Mo.*
- The Rev. Pier Paolo del Campana, S.J.** *Emeritus Professor of Comparative Religion, Sophia University, Tokyo.*
- The Rev. Philip Caraman, S.J.** *Editor, The Month, 1948–63.*
- Clifford M. Carey.** *Assistant Executive Director, National Council of the Young Men's Christian Associations, New York City.*
- John Carey.** *Merton Professor of English Literature, University of Oxford.*
- William David James Cargill Thompson** (d. 1978). *Professor of Ecclesiastical History, King's College, University of London, 1976–78.*
- The Rev. Edward Wilson Carlile.** *Liaison Officer, East Africa Appeal, Church Army, London, 1981–84; Chief Secretary, 1949–60.*
- Henry Stewart Carter** (deceased). *Minister, Memorial Church, Cambridge, Eng.*
- Ernest Cassara.** *Emeritus Professor of History, George Mason University, Fairfax, Va.*
- The Very Rev. Henry Chadwick.** *Regius Professor Emeritus of Divinity, University of Cambridge; Master of Peterhouse, Cambridge, 1987–93.*
- Nora Kershaw Chadwick** (d. 1972). *University Lecturer, University of Cambridge, 1950–58. Editor and contributor, Studies in Early British History and others.*
- W. Owen Chadwick.** *Regius Professor of Modern History, University of Cambridge, 1968–83; Dixie Professor of Ecclesiastical History, 1958–68.*
- Wing-tsit Chan** (d. 1994). *Professor of Chinese Philosophy and Culture, Dartmouth College, Hanover, N.H., 1942–66. Anna R.D. Gillespie Professor of Philosophy, Chatham College, Pittsburgh, 1966–82.*
- Helen McCaig Chandra.** *Freelance writer on Asian religions.*
- Byong-gil Chang.** *Professor of Religion, Seoul National University.*
- Kenneth K.S. Chen.** *Emeritus Professor of Oriental Languages, University of California, Los Angeles.*
- The Rev. Sok-u Choe.** *Pastor, Myong-dong Catholic Cathedral, Seoul.*
- Francis P(almer) Clarke** (deceased). *Professor of Philosophy, University of Pennsylvania, Philadelphia, 1939–66.*
- A.O.J. Cockshut.** *G.M. Young Lecturer in 19th-Century English Literature, University of Oxford; Fellow of Hertford College, Oxford. Author of Anglican Attitudes: A Study of Victorian Religious Controversies and others.*
- John Cogley** (d. 1976). *Senior Fellow, Center for the Study of Democratic Institutions, Santa Barbara, Calif., 1967–76; Editor, The Center Magazine, 1967–74. Author of The Layman and the Council and others.*
- The Rev. Louis Cognet.** *Director of Studies, Collège de Juilly, Fr.*
- Gerson D. Cohen** (d. 1991). *Chancellor, Jewish Theological Seminary of America, New York City, 1972–86; Jacob H. Schiff Professor of History, 1970–86.*
- The Very Rev. Francis J. Connell** (d. 1967). *Dean for Religious Communities, Catholic University of America, Washington, D.C., 1957–67; Professor of Moral Theology, 1949–58.*
- Thomas L. Coonan.** *Former Professor of History, St. Louis University, Mo.*
- Patricia Louise Cox.** *Freelance writer on religion.*
- Vincent Cronin.** *Freelance writer. Author of The Flowering of the Renaissance and others.*
- The Rev. Frank Leslie Cross** (d. 1968). *Lady Margaret Professor of Divinity, University of Oxford, 1944–68. Editor of The Oxford Dictionary of the Christian Church.*
- Alice Curtayne** (d. 1981). *Author of St. Catherine of Siena; The Irish Story; and others.*
- Jean Dagens.** *Former Professor of Classical French Literature, University of Strasbourg, Fr.*
- The Rev. Horton Marlais Davies.** *Henry W. Putman Professor Emeritus of the History of Christianity, Princeton University.*
- The Rev. J. Gordon Davies** (d. 1990). *Edward Cadbury Professor and Head, Department of Theology, University of Birmingham, Eng., 1960–86.*
- The Rev. Victor Cyril De Clercq, C.I.C.M.** *Former Professor of Patrology and Church History, Pontifical College Josephinum, Worthington, Ohio.*
- Count Michael de la Bedoyere** (d. 1973). *Editor, Search newsletter, 1962–68; Catholic Herald, 1934–62.*
- The Rt. Rev. Carl Gustav Diehl.** *Bishop of Tranquebar, Tamil Evangelical Lutheran Church, South India, 1967–72.*
- The Rev. Godfrey Leo Diekmann, O.S.B.** *Regents Professor of Theology, St. John's University, Collegeville, Minn. Editor of Worship.*
- George Edward Dimock, Jr.** *Emeritus Professor of Classical Languages and Literatures, Smith College, Northampton, Mass.*
- Decima L. Douie.** *Former Reader in Medieval History, University of Hull, Eng.*
- Jacques Duchesne-Guillemin.** *Emeritus Professor of Indo-Iranian Studies, State University of Liège, Belg.*
- The Rev. George H. Dunne, S.J.** *Secretary, Committee on Society, Development and Peace, World Council of Churches and the Pontifical Commission for Justice and Peace, Ecumenical Centre, Geneva, Switz., 1967–72.*
- The Very Rev. Joseph William Dunne** (deceased). *Canon of Metropolitan Chapter of Birmingham; Parish Priest, St. Mary's, The Mount, Walsall, Eng.*
- Donald F. Durnbaugh.** *Former Carl W. Zeigler Professor of Religion and History, Elizabethtown College, Pennsylvania.*
- Cornelius J. Dyck.** *Emeritus Professor of Anabaptist and Sixteenth-century Studies, Mennonite Biblical Seminary, Elkhart, Ind.*
- H. Byron Earhart.** *Professor of Religion, Western Michigan University, Kalamazoo.*
- David A. Ede.** *Associate Professor of Religion, Western Michigan University, Kalamazoo.*
- E. Earle Ellis.** *Research Professor of Theology, Southwestern Baptist Theological Seminary, Ft. Worth, Texas.*
- The Rt. Rev. John Tracy Ellis** (d. 1992). *Professor of Church History, University of San Francisco, 1964–76.*
- Gracia Fay Ellwood.** *Freelance writer on religion, mythology, and the occult.*
- Robert S. Ellwood, Jr.** *Bishop James W. Bashford Professor of Oriental Religions, University of Southern California, Los Angeles.*
- The Rev. John Adney Emerton.** *Regius Professor of Hebrew, University of Cambridge.*
- Marc Marie Escholier** (d. 1972). *Judge, Supreme Court of Appeal, Paris. Author of Port-Royal and others.*
- Josef van Ess.** *Professor of Islamic Studies and Semitic Languages, Eberhard Karl University of Tübingen, Ger.*

The Rev. Carl Evans. *Pastor, Door Village United Methodist Church, La Porte, Ind.*

The Rev. Edward Every. *Former Canon, St. George's Collegiate Church, Jerusalem.*

Brother George Every, S.S.M. (deceased). *Lecturer, Kelham Theological College, Newark, Eng.*

The Rev. Eugene Rathbone Fairweather. *Keble Professor of Divinity, Trinity College, University of Toronto, 1964–86.*

Andrea Faste. *Freelance writer on religion.*

J.W. Fiegenbaum. *Emeritus Professor of Religion, Mount Holyoke College, South Hadley, Mass.*

Floyd V. Filson. *Emeritus Dean and Emeritus Professor of New Testament, McCormick Theological Seminary, Chicago.*

Louis Finkelstein (d. 1991). *Chancellor, Jewish Theological Seminary of America, New York City, 1951–72.*

Thomas Fish. *Professor of Mesopotamian Studies, Victoria University of Manchester, 1948–60.*

The Rev. Joseph Augustine Fitzmyer, S.J. *Emeritus Professor of New Testament, Catholic University of America, Washington, D.C.*

The Ven. Charles Robert Forder. *Emeritus Archdeacon of York, Eng.; Canon and Prebendary of Fenton in York Minster, 1957–72.*

A. Durwood Foster. *Emeritus Professor of Christian Theology, Pacific School of Religion, Berkeley, Calif.*

The Rev. Kenelm Francis Foster, O.P. (d. 1986). *Reader in Italian, University of Cambridge.*

Brian Fothergill (d. 1990). *Chairman, Royal Society of Literature, 1986–89. Author of The Cardinal King and others.*

Linwood Fredericksen. *Manager, Planning and Research, Rotary International, Evanston, Ill. Associate Editor, Religion, Encyclopædia Britannica, Chicago, 1969–73.*

Hans Wilhelm Frei. *John A. Hooper Professor of Religious Studies, Yale University, 1986–88; Master, Ezra Stiles College, 1972–80.*

The Rev. Walter Freitag. *Professor of the Church in Historic Witness and Biblical Interpretation, Lutheran Theological Seminary, University of Saskatchewan, Saskatoon.*

The Rev. Reginald Michael French (deceased). *Vicar of St. James', London, 1930–55.*

The Rev. William Hugh Clifford Frend. *Emeritus Professor of Ecclesiastical History, University of Glasgow.*

Rabbi Albert H. Friedlander. *Dean of Rabbinic Studies, Leo Baeck College, London. Minister, Westminster Synagogue, London.*

Asaf Ali-Asghar Fyzee. *Vice-Chancellor, University of Jammu and Kashmir, Srinagar, India, 1957–58. Indian Ambassador to Egypt, 1949–51.*

John G. Gallaher. *Professor of History, Southern Illinois University at Edwardsville.*

The Rev. Maynard Joseph Geiger, O.F.M. *Former Historian of the Franciscan Fathers of the Pacific Coast and Archivist of Mission, Santa Barbara, Calif.*

The Rev. Joseph Gill, S.J. (d. 1989). *Professor of Byzantine Greek Language and of Byzantine History, Pontifical Oriental Institute, Rome, 1946–67.*

Nahum N. Glatzer (d. 1990). *Professor of Jewish History Brandeis University, Waltham, Mass., 1956–73.*

Judah Goldin. *Emeritus Professor of Post-Biblical Hebrew Literature, University of Pennsylvania, Philadelphia.*

Cyrus H. Gordon. *Emeritus Professor of Hebraic and Near East Studies; Director, Center for Ebla Research; New York University, New York City. Emeritus Professor of Mediterranean Studies, Brandeis University, Waltham, Mass.*

Stephen Gottschalk. *Associate Professor of History, U.S. Naval Postgraduate School, Monterey, Calif., 1972–75. Author of The Emergence of Christian Science in American Religious Life.*

John Grace (d. 1972). *National Chief Secretary, The Salvation Army, New York City, 1961–70.*

Hilda Charlotte Graef. *Author of The Light and the Rainbow; Mary, A History of Doctrine and Devotion; and others.*

Ernest (Eugene) Graf (d. 1962). *Monk of Buckfast Abbey, England.*

Robert M. Grant. *Carl Darling Buck Professor Emeritus of Humanities; Emeritus Professor of Early Christian History, Divinity School, University of Chicago.*

John Evelyn Bury Gray. *Former Reader in Sanskrit, School of Oriental and African Studies, University of London.*

The Rev. Paul Grosjean, S.J. (d. 1964). *Bollandist. Author of Henrici VI Angliae Regis Miracula Postuma and others.*

G.E. von Grunebaum (d. 1972). *Professor of History; Director, Near Eastern Center, University of California, Los Angeles, 1957–72.*

The Rev. Pierre Joseph G'ssell, O.S.B. (deceased). *Monk at Solesmes Abbey, France.*

Herbert V. Guenther. *Emeritus Professor of Far Eastern Studies, University of Saskatchewan, Saskatoon.*

The Rev. Franco Guerello, S.J. *Professor of Italian Literature, Social Institute, Turin, Italy.*

The Rev. Walter George Gumbley, O.P. (d. 1968). *Occasional Lecturer at Blackfriars, Oxford, 1942–45; 1950–61. Author of Parish Priests Among the Saints and others.*

Oliver Robert Gurney. *Emeritus Professor of Assyriology, University of Oxford.*

Oskar Halecki (d. 1973). *Professor of Eastern European History, Graduate School, Fordham University, New York City, 1944–61. Honorary President, Polish Institute of Arts and Science, New York City.*

Edward Elton Young Hales (d. 1986). *Author of Revolution and Papacy and others.*

The Rev. François Halkin, S.J. *Bollandist. Author of Bibliotheca Hagiographica Graeca and others.*

The Rev. Basil Hall (d. 1994). *Fellow and Dean, St. John's College, University of Cambridge, 1975–80. Professor of Ecclesiastical History, Victoria University of Manchester, 1967–75.*

Bernice Margaret Hamilton. *Life member, Clare Hall, University of Cambridge. Former Senior Lecturer in Politics, University of York, Heslington, Eng.*

The Rev. Robert Theodore Handy. *Henry Sloane Coffin Professor Emeritus of Church History, Union Theological Seminary, New York City.*

Edward R. Hardy (d. 1981). *Lecturer in Early Church History, University of Cambridge, 1969–75. Professor of Church History, Berkeley Divinity School, New Haven, Conn., 1947–69.*

Ruth Mulvey Harmer. *Emeritus Professor of English and Modern Languages, California State Polytechnic University, Pomona.*

The Rev. Carl John Hemmer, S.J. *Former Research Assistant of Ecclesiastical History, Colegio de San Estanislao, Salamanca, Spain.*

Carl F.H. Henry. *Theologian. Lecturer-at-Large, World Vision International. Writer and editor on religion.*

The Rev. Ben Mohr Herbster (d. 1984). *President, United Church of Christ, 1961–69.*

Ferdinand Aloys Hermens. *Emeritus Professor of Political Science, University of Cologne.*

The Most Rev. Edward Louis Heston, C.S.C. (d. 1973). *Chairman, Pontifical Social Communications Commission, Vatican City, 1971–73.*

Naofusa Hirai. *Emeritus Professor of Shinto Studies, Kokugakuin University, Tokyo.*

H.Z. Hirschberg (d. 1976). *Professor of Jewish History in Muslim Countries, Bar-Ilan University, Ramat Gan, Israel.*

The Rev. Ian Hislop, O.P. *Former Provincial of the English Dominican Province.*

John Thayer Hitchcock. *Professor of Anthropology and South Asian Studies, University of Wisconsin, Madison.*

Philip Khuri Hitti (d. 1978). *Professor of Semitic Literature, Princeton University, 1936–54.*

Lauri O. Honko. *Professor of Folkloristics and Comparative Religion, University of Turku, Fin.*

Winthrop S. Hudson. *James B. Colgate Professor of the History of Christianity, Colgate Rochester Divinity School, Rochester, N.Y., 1948–77. Professor of History, University of Rochester, 1970–77.*

The Rev. Gordon Huelin. *Vicar, St. Margaret Pattens, London. Lecturer in Ecclesiastical History, King's College, University of London.*

William Robert Hutchison. *Charles Warren Professor of the History of Religion in America, Harvard University.*

J. Philip Hyatt (d. 1972). *Professor of Old Testament, Vanderbilt University, Nashville, Tenn., 1944–72.*

S.M. Ikram (d. 1973). *Director, Institute of Islāmic Culture, Lahore, Pak.*

Toshihiko Izutsu (d. 1993). *Professor of Islāmic Studies, McGill University, Montreal, 1969–75.*

Carl T. Jackson. *Professor of History, University of Texas at El Paso.*

Edmond Jacob. *Emeritus Professor of Old Testament Exegesis, University of Strasbourg, Fr.*

The Rev. Jerome Vincent Jacobsen, S.J. (d. 1970). *Professor of History, Loyola University, Chicago.*

Thorkild Jacobsen (d. 1993). *Professor of Assyriology, Harvard University, 1962–74.*

The Rev. Edwin Oliver James (d. 1972). *Chaplain of All Souls College, University of Oxford. Professor of the History and Philosophy of Religion, University of London.*

The Rev. Daniel T. Jenkins. *Weyerhaeuser Professor of Systematic Theology, Princeton Theological Seminary, N.J., 1981–84.*

Eric John. *Former Reader in History, Victoria University of Manchester.*

Sherman Elbridge Johnson. *Dean, Church Divinity School of the Pacific, Berkeley, Calif., 1951–72.*

J. Stillson Judah. *Emeritus Professor of the History of Religions, Pacific School of Religion and Graduate Theological Union, Berkeley, Calif.*

Mark Juergensmeyer. *Former Professor of Religion, University of Hawaii at Manoa, Honolulu.*

Max Kaltenmark. *Director of Studies, École Pratique des Hautes Études (Institute for Advanced Research), Paris, 1957–78.*

Arvid S. Kapelrud. *Professor of Old Testament, University of Oslo.*

Firuz Kazemzadeh. *Professor of History, Yale University. Former Chairman, National Spiritual Assembly of the Baha'is of the United States.*

Elie Kedourie (d. 1992). *Professor of Politics, London School of Economics and Political Science, University of London, 1965–90.*

The Rev. John N.D. Kelly (d. 1997). *Principal of St. Edmund Hall, Oxford, 1951–79; Lecturer in Patristic Studies, University of Oxford, 1948–76.*

The Rev. John Arthur Kemp, S.J. (d. 1963). *Professor of Medieval History, Loyola University, Chicago, 1959–63.*

Malcolm H. Kerr (d. 1984). *President, American University of Beirut, 1982–84. Professor of Political Science, University of California, Los Angeles, 1967–82.*

The Rt. Rev. Sylvester Michael Killeen, O. Praem. *Former Chancellor, Saint Norbert College, De Pere, Wis.*

Joseph M. Kitagawa (d. 1992). *Professor of the History of Religions and of Far Eastern Languages and Civilizations, University of Chicago, 1964–85.*

George Angus Fulton Knight. *President, Pacific Theological College, Suva, Fiji, 1965–72.*

The Rev. Michael David Knowles, O.S.B. (d. 1974). *Regius Professor of Modern History, University of Cambridge, 1954–63.*

The Most Rev. Franz Cardinal König. *Archbishop of Vienna, 1956–85.*

Gottfried Georg Krodell. *Professor of History and Church History, Valparaiso University, Ind.*

Bruno Kroker. *Freelance writer on American Protestantism.*

Hans Kühner (d. 1986). *Historian and freelance writer. Specialist on the history of the Roman Catholic Church and the Papacy. Author of Encyclopedia of the Papacy and others.*

Werner Georg Kümmel. *Emeritus Professor of New Testament, Philipps University of Marburg, Ger.*

Stephan George Kuttner (d. 1996). *Professor of Canon Law, University of California, Berkeley, 1970–88. President, Institute of Research and Study in Medieval Canon Law, 1955–91.*

Gerhart B. Ladner (deceased). *Professor of History, University of California, Los Angeles, 1963–78.*

The Most Rev. Pio Laghi. *Ambassador of the Vatican to the United States.*

Helen B. Lamb (d. 1975). *Author of Economic Development of India.*

The Rev. John William Lamb. *Former Canon of York. Member, National Church Assembly, England. Author of The Archbishopric of Lichfield and others.*

Eugene N. Lane. *Professor of Classics, University of Missouri, Columbia.*

Henri Laoust (d. 1983). *Professor of Sociology of Islām, Collège de France, Paris, 1956–76.*

Harriet Pratt Lattin (deceased). *Historian. Author of The Peasant Boy Who Became Pope.*

The Rev. M.-H. Laurent, O.P. (deceased). *Keeper of the Vatican Library.*

Clifford Hugh Lawrence. *Professor of Medieval History, Bedford College, University of London.*

Du-hyon Lee. *Professor, Teacher's College, Seoul National University.*

Sid Z. Leiman. *Professor of Jewish History and Literature; Chairman, Department of Judaic Studies, Brooklyn College, City University of New York.*

The Rev. Augustin Pierre Léonard, O.P. *Professor of Theology, Dominican College of La Sarte, Belg., and University of Notre Dame, Ind.*

The Rev. Joseph Leonard, C.M. (deceased). *Lecturer at St. Mary's College, London. Author of Saint Vincent de Paul and Mental Prayer.*

The Rev. William Paul Le Saint, S.J. *Professor of Theology; President of the Faculty, St. Mary of the Lake Seminary, Mundelein, Ill., 1965–70.*

Sir Shane Leslie (d. 1971). *Author of Memoir of Cardinal Gasquet and others.*

Fairy von Lilienfeld. *Professor of the Theology of the Christian East, Friedrich Alexander University of Erlangen-Nürnberg, Ger.*

The Rev. Poul Georg Lindardt. *Professor of Church History, University of Aarhus, Den., 1942–80.*

Gillian Lindt. *Professor of Religion, Columbia University.*

Franklin Hamlin Littell. *Professor of Religion, Temple University, Philadelphia.*

The Rev. Charles Patrick Loughran, S.J. *Emeritus Professor of European History, Fordham University, New York City.*

Frederick Stanley Lusby. *Professor of Religious Studies, University of Tennessee, Knoxville.*

The Rev. Thomas Timothy McAvoy, C.S.C. (d. 1969). *Archivist and Professor of History, University of Notre Dame, Ind.*

George Englert McCracken. *Emeritus Professor of Classical Languages, Drake University, Des Moines, Iowa.*

The Rev. James Stevenson McEwen (d. 1993). *Professor of Church History, University of Aberdeen, Scot., 1958–77.*

Sister Mary Emmanuel McIver, O.S.U. *Former Professor of Theology, College of New Rochelle, N.Y.*

The Rev. John L. McKenzie (d. 1991). *Professor of Theology, DePaul University, Chicago, 1970–78.*

Joseph Cumming McLelland. *Professor of Philosophy of Religion; Dean, Faculty of Religious Studies, McGill University, Montreal.*

William Hewat McLeod. *Professor of History, University of Otago, Dunedin, N.Z.*

William Gerald McLoughlin (d. 1993). *Professor of History, Brown University, Providence, R.I., 1963–92. Author of Modern Revivalism: C.G. Finney to Billy Graham.*

John F. McMahon. *General and Commander in Chief, Volunteers of America, New York City, 1958–80.*

The Rev. Francis Gerard McManamin, S.J. *Former Associate Professor of History, Loyola College, Baltimore.*

The Rev. Robert Edward McNally, S.J. (d. 1977). *Professor of Historical Theology, Fordham University, New York City, 1966–77.*

The Very Rev. Joseph McSorley (d. 1963). *Superior General of the Paulist Fathers, 1924–29.*

The Right Rev. Msgr. Richard C. Madden. *Former Pastor, St. John the Beloved, Summerville, S.C.*

William Mahony. *Professor of Religion, Davidson College, N.C.*

George Makdisi. *Emeritus Professor of Arabic and Islamic Studies, University of Pennsylvania, Philadelphia.*

Cyril Alexander Mango. *Bywater and Sotheby Professor of Byzantine and Modern Greek, University of Oxford.*

The Rev. William W. Manross. *Emeritus Professor of Church History, Philadelphia Divinity School, Pa.*

Clyde L. Manschreck. *Chavanne Professor of Religious Studies, Rice University, Houston, Texas. Emeritus Professor of the History of Christianity, Chicago Theological Seminary.*

The Rev. Joseph M.-F. Marique, S.J. (deceased). *Director, Institute of Early Christian Iberian Studies, College of the Holy Cross, Worcester, Mass.*

John S. Marshall (d. 1979). *Professor of Philosophy, University of the South, Sewanee, Tenn., 1946–68.*

Ira Jay Martin III (d. 1983). *Henry Mixter Penniman Professor of Philosophy and Religion, Berea College, Ky., 1966–77.*

Martin E. Marty. *Fairfax M. Cone Distinguished Service Professor, Divinity School, University of Chicago. Senior Editor, The Christian Century.*

Masutani Fumio. *Former Professor of the History of Religion, Taisho University, Tokyo.*

The Rev. Vivian John Manley Matthews. *Priest of the London Oratory, Eng.*

Sengaku Mayeda. *Vice President, Musashino Women's University, Tokyo. Former Professor of Indian Philosophy, University of Tokyo.*

Louis Mazoyer. *Former Teacher at the Lycée Condorcet, Paris.*

Sidney Earl Mead. *Professor of History and of Religion, University of Iowa, Iowa City, 1964–72.*

Bernard E. Meland (d. 1993). *Professor of Constructive Theology, University of Chicago, 1945–64.*

The Rev. William Moelwyn Merchant. *Professor of English Language and Literature, University of Exeter, Eng., 1961–74. Emeritus Canon of Salisbury Cathedral.*

Reinhold Merkelbach. *Emeritus Professor of Classics, University of Cologne.*

The Rev. John Meyendorff (d. 1992). *Dean, St. Vladimir's Orthodox Theological Seminary, Tuckahoe, N.Y., 1984–92. Professor of Byzantine and East European History, Fordham University, New York City, 1967–92.*

John Richard Meyer. *Associate Professor of Education, University of Windsor, Ont.*

Rabbi Eugene Mihaly. *Professor of Homiletics and Midrash, Hebrew Union College–Jewish Institute of Religion, Cincinnati, Ohio.*

The Rev. Raymond Joseph Miller, C.S.S.R. *Former Pastor, St. Leo's Church, Versailles, Ky.*

Nicholas Byram Millet. *Professor of Near Eastern Studies, University of Toronto.*

Kyong-bae Min. *Professor of Religion, Yonsei University, Seoul.*

Christine Mohrmann. *Former Professor of Early Christian Greek and Latin, and Medieval Latin, Catholic University of Nijmegen, Neth.*

Mary Moriarty. *Benedictine of Stanbrook Abbey, Worcester, Eng. Author of The Saints in Silhouette; translator and editor of A Capuchin Chronicle.*

The Rev. Claude Beaufort Moss (d. 1964). *Lecturer at Bishop's College, Cheshunt, Eng.*

James DeForest Murch (d. 1973). *Member, Board of Administration, 1958–71; Publications Director, 1945–58, National Association of Evangelicals.*

The Rev. Francis Xavier Murphy, C.S.S.R. *Emeritus Professor of Patristic Moral Theology, Academia Alfonsiana, Rome. Staff editor for Patrology, New Catholic Encyclopedia.*

A. Victor Murray (d. 1967). *President of Cheshunt College, Cambridge, 1945–59. Professor of Education, University of Hull, Eng., 1933–45.*

Tiruppattur Ramasesharryar Venkatachala Murti. *Emeritus Professor of Philosophy, Banaras Hindu University, Varanasi, India.*

The Rev. Wilfrid Myatt, C.J.M. *Coeditor of Saint John Eudes: a Spiritual Portrait and others.*

Seyyed Hossein Nasr. *University Professor of Islamic Studies, George Washington University, Washington, D.C.*

The Rt. Rev. Stephen Charles Neill (d. 1984). *Professor of Philosophy and Religious Studies, University of Nairobi, Kenya, 1969–73.*

James D. Nelson. *Professor of Church History, United Theological Seminary, Dayton, Ohio.*

David Hay Newsome. *Master of Wellington College, Crowthorne, Eng. Fellow of Emmanuel College, University of Cambridge, 1959–70.*

John Thomas Nichol. *Professor of History; Vice President for Academic Affairs, Bentley College, Waltham, Mass.*

The Rev. Richard Patrick Noonan, S.J. *Alumni Director, McQuaid Jesuit High School, Rochester, N.Y.*

John B(oyer) Noss (d. 1980). *Professor of Philosophy, Franklin and Marshall College, Lancaster, Pa. Adjunct Professor of World Religions and the Christian Faith, Lancaster Theological Seminary, Pa.*

Morgan Phelps Noyes (d. 1972). *Associate Professor of Practical Theology, Union Theological Seminary, New York City, 1945–51. Minister, Central Presbyterian Church, Montclair, N.J., 1932–57.*

Geoffrey Fillingham Nuttall. *Lecturer in Church History, New College, University of London, 1945–77.*

The Rev. Austin Oakley (d. 1977). *Secretary, Anglican and Eastern Orthodox Churches Association, London, 1945–53. Vicar of St. Johns, London, 1944–62.*

Sir Dimitri Obolensky. *Emeritus Professor of Russian and Balkan History, University of Oxford.*

The Rev. Elmer O'Brien, S.J. *Writer in Residence, Ignatius College, Guelph, Ont. Research Professor of Theology, Loyola College, Montreal, 1966–73.*

The Rev. Thomas Gerald O'Callaghan, S.J. *Associate Professor of Religious Studies, Fairfield University, Conn.*

Daniel William O'Connor. *Charles A. Dana Professor Emeritus of Religious Studies and of Classical Languages, Saint Lawrence University, Canton, N.Y.*

Tarlach O'Raifeartaigh (deceased). *Chairman, Cultural Relations Committee, Dublin. Editor of Genealogical Tracts I.*

The Rev. William James O'Shea. *Former Professor of Church History and Liturgy, St. Mary's Seminary, Baltimore.*

Eberhard Otto (d. 1974). *Professor of Egyptology, Rupert Charles University of Heidelberg, W.Ger.*

The Rev. Paul F. Palmer, S.J. (d. 1982). *Professor of Theology, Fordham University, New York City.*

Pascal P. Parente (d. 1971). *Professor of Ascetical and Mystical Theology, Catholic University of America, Washington, D.C., 1938-60.*

Herbert William Parke (d. 1986). *Professor of Ancient History, Trinity College, University of Dublin, 1934-73.*

The Rev. Thomas Maynard Parker (d. 1985). *Fellow of University College, Oxford; University Lecturer in Theology, University of Oxford, 1950-73.*

André Parrot (d. 1980). *Archaeologist. Director of the Louvre, Paris, 1968-72.*

Wilhelm Pauck (d. 1981). *Professor of Church History, Union Theological Seminary, New York City, 1953-67.*

The Rev. Ernest Alexander Payne (d. 1980). *President, World Council of Churches, 1968-75.*

Jaroslav Jan Pelikan. *Sterling Professor of History, Yale University. President, American Academy of Arts and Sciences.*

Norman Perrin (d. 1976). *Professor of New Testament, University of Chicago, 1969-76.*

Gerald Bernard Phelan (d. 1965). *Professor of Philosophy, St. Michael's College, University of Toronto, and Pontifical Institute of Medieval Studies, Toronto.*

The Rev. Arthur Carl Piepkorn (d. 1973). *Graduate Professor of Systematic Theology, Concordia Seminary, St. Louis, Mo., 1963-73.*

The Rev. Martin Pierce. *Vicar of St. John's Mickleover, Derby, Eng.*

John Richard Thornhill Pollard. *Former Senior Lecturer in Classics, University College of North Wales, University of Wales, Bangor.*

Harry Culverwell Porter. *Lecturer in History, University of Cambridge.*

Eli Daniel Potts. *Associate Professor of History, Monash University, Clayton, Australia. Author of British Baptist Missionaries in India, 1793-1837.*

The Rev. Leon Pouliot, S.J. *Former Teacher of Church History, Collège Sainte-Marie, Montreal.*

James M(atthew) Powell. *Professor of Medieval History, Syracuse University, N.Y.*

Henri-Charles Puech (d. 1986). *Professor of History of Religions, Collège of France, Paris, 1952-72. Director of Religious Studies, École Pratique des Hautes Études (Institute for Advanced Research), Paris.*

The Rev. William Arthur Purdy (d. 1994). *Secretary for Anglican and Methodist Relations, Secretariat for Promoting Christian Unity, Vatican.*

John Francis Quinn. *Professor of Philosophy, Pontifical Institute of Medieval Studies, Toronto.*

The Very Rev. Msgr. William Joseph Quinn. *Former Executive Secretary, Bishops' Committee for Migrant Workers, Chicago. Former Codirector, Latin-American Bureau, National Catholic Welfare Conference, Washington, D.C.*

Gilles Quispel. *Former Professor of Early Church History, State University of Utrecht, Neth.*

Fazlur Rahman (d. 1988). *Professor of Islāmic Philosophy, University of Chicago, 1969-88.*

Helen Louise Redpath (Sister Dominic) (d. 1965). *Bridgettine Nun of Syon Abbey, Devon, Eng.*

Marjorie E. Reeves. *Honorary Fellow and former Vice-Principal, St. Anne's College, Oxford; former Lecturer in Modern History, University of Oxford.*

Ernest Edwin Reynolds (d. 1980). *Author of Baden-Powell; Three Cardinals; and others.*

The Rev. James A. Reynolds. *Former Professor of Church History, St. Joseph's Seminary, Yonkers, N.Y.*

The Rev. Joseph Alfred Richard. *Society of Missionaries of Africa, the White Fathers.*

James T. Richardson. *Professor of Sociology and Judicial Studies, University of Nevada, Reno.*

Theodore Henry Robinson (d. 1964). *Professor of Semitic Languages, University College of South Wales and Monmouthshire, Cardiff, 1927-44.*

The Very Rev. Gerard Rooney, C.P. *Former Director, Department of Education, Diocese of Worcester, Mass.*

Herbert Jennings Rose (d. 1961). *Professor of Greek, University of St. Andrews, Scot., 1927-53.*

Henry Rosemont, Jr. *Professor of Philosophy, St. Mary's College of Maryland.*

Erwin I.J. Rosenthal (d. 1991). *Reader in Oriental Studies, University of Cambridge, 1959-71.*

Franz Rosenthal. *Former Sterling Professor of Near Eastern Languages, Yale University.*

Judah M. Rosenthal (d. 1976). *Professor of Biblical Exegesis, College of Jewish Studies, Chicago, 1944-69.*

Anne Ross. *Freelance writer on Celtic mythology.*

The Rev. Ernest Gordon Rupp (d. 1986). *Dixie Professor of Ecclesiastical History, University of Cambridge, 1968-77.*

The Rev. Edward A. Ryan, S.J. (d. 1964). *Rector, Our Lady of Martyrs Tertianship, Auriesville, N.Y., 1962-64. Professor of Church History, Woodstock College, Md., 1936-62.*

The Rt. Rev. Msgr. J(ohn) Joseph Ryan. *Emeritus Professor of Church History, St. John's Seminary, Brighton, Mass. Emeritus Professor of Medieval History, Pontifical Institute of Medieval Studies, Toronto.*

J. Coert Rylaarsdam. *Emeritus Professor of Old Testament Theology, University of Chicago. Emeritus Professor of Theology, Marquette University, Milwaukee.*

William Merritt Sale III. *Professor of Classics and Comparative Literature, Washington University, St. Louis, Mo.*

Matti Salo. *Former Assistant Professor of Anthropology, Northern Illinois University, De Kalb.*

Ernest R. Sandeen (d. 1982). *Professor of History, Macalester College, St. Paul, Minn., 1973-82.*

Dittakavi Subrahmanya Sarma. *Principal Emeritus of Vivekananda College, Madras, India.*

Genjun H. Sasaki. *Professor of Buddhism, Otani University, Kyōto, Japan.*

Thomas A. Schafer. *Emeritus Professor of Church History, McCormick Theological Seminary, Chicago.*

Eva Schaper (d. 1992). *Titular Professor of Logic, 1977-90; Head, Department of Logic, University of Glasgow, 1982-84.*

Robert P. Scharlemann. *Commonwealth Professor of Religious Studies, University of Virginia, Charlottesville.*

Rivka Schatz-Uffenheimer (deceased). *Edmonton Professor of Jewish Mysticism, Hebrew University of Jerusalem.*

Joseph Herman Schauinger. *Professor of History, College of St. Thomas, St. Paul, Minn.*

Annemarie Schimmel. *Former Professor of Indo-Muslim Culture, Harvard University.*

The Rt. Rev. Alexander Schmemmann (d. 1983). *Dean, St. Vladimir's Orthodox Theological Seminary, Crestwood, N.Y.*

Reiner Schürmann (d. 1993). *Professor of Philosophy, Graduate Faculty, New School for Social Research, New York City, 1984-93.*

Keith H. Seddon. *Freelance writer. Coauthor of Understanding Tarot and others.*

Amulya Chandra Sen. *Former Editor, The Indo-Asian Culture. Author of Asoka's Edicts and others.*

Umakant Premanand Shah (d. 1988). *Deputy Director, Oriental Institute, Maharaja Sayajirao University of Baroda, India.*

Roger Sharrock (d. 1991). *Professor of English Language and Literature, King's College, University of London, 1968–81.*

The Rev. Ronald Duncan Mackintosh Shaw (d. 1972). *Missionary Professor, Central Theological College, Rikkyo University, Tokyo, 1922–37.*

The Rt. Rev. Msgr. George William Shea. *Pastor Emeritus, Our Lady of Sorrows Church, South Orange, N.J.*

The Most Rev. Fulton John Sheen (d. 1979). *Bishop of the Diocese of Rochester, N.Y., 1966–69.*

Lancelot Capel Sheppard (d. 1971). *Editor, "Faith and Fact Series," Twentieth Century Encyclopaedia of Catholicism.*

Franklin Sherman. *Director, Institute for Jewish-Christian Understanding, Muhlenberg College, Allentown, Pa.*

The Rev. Joseph Hsing-san Shih. *Professor of Missions and Sinology, Pontifical Gregorian University, Rome.*

Ailon Shiloh. *Professor and Director of Graduate Studies, Department of Anthropology, University of South Florida, Tampa.*

David Clark Shipley. *Emeritus Professor of Theology, Methodist Theological School, Delaware, Ohio.*

Donald Howard Shively. *Professor of Japanese History and Literature, Harvard University.*

Lou Hackett Silberman. *Hillel Professor Emeritus of Jewish Literature and Thought, Vanderbilt University, Nashville, Tenn.*

Akiba Ernst Simon. *Emeritus Professor of Education, Hebrew University of Jerusalem.*

The Rev. Joachim Frederick Smet, O.Carm. *Editor of Philippe de Mézières's The Life of St. Peter Thomas.*

The Rev. B.T.D. Smith. *Lecturer in Divinity, University of Cambridge, 1915–50.*

Jonathan Z. Smith. *Robert O. Anderson Distinguished Service Professor of the Humanities, University of Chicago.*

The Rev. James Hutchinson Smylie. *Ernest Trice Thompson Professor of Church History, Union Theological Seminary, Richmond, Va.*

The Rev. Norman Henry Snaith (d. 1982). *Principal, 1954–61; Tutor in Old Testament Languages and Literature, 1936–61, Wesley College, Leeds, Eng.*

Ida Sloan Snyder. *Associate and News Director, Bureau of Communications, National Board of the Young Women's Christian Association, New York City.*

The Rev. John Songster, S.J. *Assistant Professor Emeritus of History, Georgetown University, Washington, D.C.*

Jacques Soustelle (d. 1990). *Director of Studies, School of Advanced Studies in the Social Sciences, Paris, 1969–85.*

James C. Spalding (d. 1996). *Professor of Religion, University of Iowa, Iowa City.*

Matthew Spinka (d. 1972). *Professor of Church History, Hartford Seminary Foundation, Conn., 1943–58.*

The Rev. John Stacey. *Former Secretary, Local Preachers' Office, British Methodist Church, London; former Editor, Epworth Press.*

James Stevenson. *Emeritus Fellow of Downing College, Cambridge; formerly University Lecturer in Divinity, University of Cambridge.*

John J. Stoudt. *Professor of Philosophy, Kutztown State College, Pennsylvania, 1965–70. Freelance writer and researcher.*

Frederick J. Streng (d. 1993). *Professor of the History of Religions, Southern Methodist University, Dallas, Texas, 1974–93.*

The Rev. Dom Anselm Strittmatter, O.S.B. (d. 1978). *Prior, St. Anselm's Abbey, Washington, D.C., 1961–67.*

John Strugnell. *Professor of Christian Origins, Harvard University.*

Herbert P. Sullivan. *Professor of Religion and Dean, Vassar College, Poughkeepsie, N.Y.*

The Very Rev. Norman Sykes (d. 1961). *Dean of Winchester, Eng., 1958–61.*

The Rev. William Telfer (d. 1968). *Canon of Ely. Master of Selwyn College, University of Cambridge, 1947–56.*

Sydney A. Temple, Jr. *Lecturer in Classical Languages, University of Hawaii, Honolulu.*

Mary Frances Thelen. *Professor of Religion, Randolph-Macon Woman's College, Lynchburg, Va. Author of Man as Sinner in Contemporary American Realistic Theology.*

The Rev. Antonine Severin Tibesar, O.F.M. *Emeritus Professor of History, Catholic University of America, Washington, D.C. Former Director, Academy of American Franciscan History, Washington, D.C.*

Thomas Forsyth Torrance. *Emeritus Professor of Christian Dogmatics, University of Edinburgh.*

L.J. Trinterud (deceased). *Professor of Church History, San Francisco Theological Seminary, San Anselmo, Calif.*

Jacques Truchet. *Emeritus Professor of French Literature, University of Paris IV.*

Harold Walter Turner. *Director, Study Centre for New Religious Movements in Primal Societies, Selly Oak Colleges, Birmingham, Eng.*

Isadore Twersky. *Littauer Professor of Hebrew Literature and Philosophy, Harvard University.*

Walter Ullmann (d. 1983). *Professor of Medieval History, University of Cambridge, 1972–78; Professor of Ecclesiastical History, 1965–72.*

James Herman Van der Veldt (d. 1977). *Professor of Psychology, Catholic University of America, Washington, D.C., 1945–62. Coauthor of Psychiatry and Catholicism.*

The Rev. Alexander Roper Vidler (d. 1991). *Fellow and Dean of King's College, Cambridge, 1956–66; Lecturer in Divinity, University of Cambridge, 1959–67.*

The Rev. Aubrey Russell Vine (d. 1973). *General Secretary, Free Church Federal Council.*

Arthur Vööbus (d. 1988). *Professor of New Testament and Church History, Lutheran School of Theology at Chicago, 1948–77.*

The Rev. Canon Herbert Montague Waddams (d. 1972). *Residentiary Canon of Canterbury Cathedral, Eng., 1962–72.*

David Waines. *Senior Lecturer in Islamic Studies, University of Lancaster, Eng.*

Francis Redding Walton. *Emeritus Director of the Gennadius Library, American School of Classical Studies, Athens.*

The Rt. Rev. and Rt. Hon. John William Charles Wand (d. 1977). *Canon and Treasurer of St. Paul's Cathedral, and Editor, Church Quarterly Review, 1956–69. Bishop of London, 1944–55.*

James Hamilton Ware, Jr. *Professor of Philosophy and Religion, Austin College, Sherman, Texas.*

Edward Ingram Watkin (d. 1981). *Author of Neglected Saints and others.*

The Very Rev. Hugh Watt (d. 1968). *Professor of Church History, New College, 1919–50; University of Edinburgh, 1935–50.*

William Montgomery Watt. *Professor of Arabic and Islamic Studies, University of Edinburgh, 1964–79.*

Rabbi Meyer Waxman (d. 1969). *Professor, Hebrew Theological College, Skokie, Ill.*

The Rev. Gustave Weigel, S.J. (d. 1964). *Professor of Ecclesiology, Woodstock College, Md., 1948–64.*

Egon Joseph Wellesz (d. 1974). *Composer. Reader in Byzantine Music, University of Oxford, 1948–56.*

R.J. Zwi Werblowsky. *Emeritus Professor of Comparative Religion, Hebrew University of Jerusalem.*

James King West (d. 1984). *Professor of Religion and Philosophy, Catawba College, Salisbury, N.C.*

William J. Whalen. *Associate Professor of Communication, Purdue University, West Lafayette, Ind.; Director of Publications and University Editor; Director, Purdue University Press. Author of Minority Religions in America and others.*

The Rev. John Lloyd White, S.M. *Former Provincial Director of Education, Washington Province of the Society of Mary.*

The Very Rev. Henry Charles Whitley (d. 1976). *Minister of St. Giles' Cathedral, Edinburgh, 1954-72.*

Allen Paul Wikgren. *Emeritus Professor of New Testament Language and Literature, University of Chicago.*

Hellmut Wilhelm (d. 1990). *Professor of Chinese History and Literature, University of Washington, Seattle.*

Robert L. Wilken. *Professor of the History of Christianity, University of Notre Dame, Ind.*

George Huntston Williams. *Hollis Professor of Divinity, Harvard University.*

J. Paul Williams (d. 1973). *Professor of Religion, Mt. Holyoke College, South Hadley, Mass., 1945-66.*

John Alden Williams. *Professor of Arab Studies, American University in Cairo. Professor of Art and Islamic Studies, University of Texas at Austin.*

Bryan R. Wilson. *Emeritus Reader in Sociology, University of Oxford.*

Gustaf Wingren. *Emeritus Professor of Systematic Theology, University of Lund, Swed.*

The Rev. Allan Bernard Wolter, O.F.M. *Professor of Philosophy, Catholic University of America, Washington, D.C.*

Douglas Woodruff (d. 1978). *Editor, The Tablet, London, 1936-67. Author of Church and State in History and others.*

Donald Ernest Wilson Wormell (d. 1990). *Professor of Latin, University of Dublin, 1942-78.*

Franklin Woodrow Young. *Amos Ragan Kearns Professor Emeritus of New Testament and Patristic Studies, Duke University, Durham, N.C.*

Ying-shih Yu. *Michael Henry Strater Professor of East Asian Studies and of History, Princeton University.*

Sa-sun Yun. *Professor, Teacher's College, Seoul National University.*

The Rev. John H. Ziegler, C.S.P. *Former Chaplain to Catholic Students, University of Connecticut, Storrs.*

Larzer Ziff. *Caroline Donovan Professor of English, Johns Hopkins University, Baltimore.*

Part Nine. The History of Mankind

William Wright Abbot. *James Madison Professor of History, University of Virginia, Charlottesville.*

Thomas Perkins Abernethy (d. 1975). *Richmond Alumni Professor of History, University of Virginia, Charlottesville, 1930-61.*

Hélène Ahrweiler. *Chancellor, University of Paris, 1982-89; former Professor of the History of Byzantine Civilization, University of Paris I.*

George Akita. *Professor of History, University of Hawaii at Manoa, Honolulu.*

Victor Alba. *Emeritus Professor of Political Science, Kent State University, Ohio.*

John Richard Alden (d. 1991). *James B. Duke Professor of History, Duke University, Durham, N.C., 1963-75.*

Anthony Dolphin Alderson. *Historian and translator. Director of Transouth Ltd., Fareham, Eng.*

Robert J. Alexander. *Emeritus Professor of Economics and Political Science, Rutgers University, New Brunswick, N.J.*

Mohammad Ali (deceased). *Professor and Head, Department of History, Kābul University, Afg.*

Frank Raymond Allchin. *Emeritus Reader in Indian Studies, University of Cambridge.*

Mary L. Allison. *Freelance writer.*

Roberto Almagià (d. 1962). *Professor of Geography, University of Rome, 1915-59.*

Antony Andrewes (d. 1990). *Wykeham Professor of Ancient History, University of Oxford, 1953-77.*

Nikolay Andreyev (d. 1982). *Reader in Russian Studies, University of Cambridge; Fellow of Clare Hall, Cambridge.*

Roy Edgar Appleman. *Lieutenant Colonel, U.S. Army (retired). Historian, National Park Service, U.S. Department of the Interior, Washington, D.C., 1936-70.*

Karl Otmar, Baron von Aretin. *Head Editor, Neue Deutsch Biographie. Emeritus Professor of Contemporary History, Technical University of Darmstadt, Ger.*

Hassan Arfa. *Major General, Iranian Army (retired). Author of Under Five Shahs and others.*

Daniel Argov. *Former Lecturer in Modern Indian History, Institute of Asian and African Studies, Hebrew University of Jerusalem.*

Maurice Ashley (d. 1994). *Research Fellow, Loughborough University of Technology, Eng., 1967-70. Author of England in the Seventeenth Century and others.*

Arthur C.V.D. Aspinall (d. 1972). *Professor of Modern History, University of Reading, Eng., 1947-65.*

Clement Richard Attlee, 1st Earl Attlee (d. 1967). *Prime Minister of Great Britain, 1945-51. Labour Party Leader, 1935-56.*

Jacques, Comte d'Avout (d. 1978). *Historian. Author of La Querelle des Armagnacs et des Bourguignons and others.*

The Rev. Tarsicio de Azcona. *Emeritus Professor of Church History, University of Navarre, Pamplona, Spain.*

Michael Graham Balfour (d. 1995). *Professor of European History, University of East Anglia, Norwich, Eng., 1966-74.*

Evan Whyte-Melville Balfour-Melville (deceased). *Senior Lecturer in History, University of Edinburgh.*

Manuel Ballesteros Gaibrois. *Professor and Head, Section of American History, University of Madrid.*

Kenneth A. Ballhatchet (d. 1995). *Professor of the History of South Asia, School of Oriental and African Studies, University of London.*

John P.V. Dacre Balsdon (d. 1977). *Fellow of Exeter College, University of Oxford, 1928-69.*

Ivo Banac. *Professor of History, Yale University.*

Margaret Amelia Banks. *Former Law Librarian, University of Western Ontario, London.*

Cyril Nelson Barclay (d. 1979). *Brigadier, The Cameronians (Scottish Rifles). Editor, The Army Quarterly and Defence Journal, 1950-66; coeditor, Brassey's Annual: The Armed Forces Year Book, 1950-69.*

Thomas Swain Barclay. *Emeritus Professor of Political Science, Stanford University, Calif.*

William Eldon Baringer. *Historical writer. Professor of History, University of Florida, Gainesville, 1977-81.*

John Walton Barker, Jr. *Professor of History, University of Wisconsin, Madison.*

Frank Barlow. *Emeritus Professor of History, University of Exeter, Eng.*

Geoffrey Wallis Steuart Barrow. *Sir William Fraser Professor of Scottish History and Palaeography, University of Edinburgh.*

Dieter Bartels. *Instructor in Social Sciences/Humanities, Yavapai College, Clarkdale, Ariz.*

Michael Bar-Zohar. *Freelance writer. Member of the Knesset. Lecturer in Political Science, Haifa University, Israel, 1970-73.*

Arthur Llewellyn Basham (d. 1986). *Professor of Asian Civilizations, Australian National University, Canberra.*

Charles R. Bawden. *Emeritus Professor of Mongolian, University of London.*

Douglas C. Baxter. *Associate Professor of History, Ohio University, Athens.*

John Cawte Beaglehole (d. 1971). *Professor of British Commonwealth History, Victoria University of Wellington, N.Z., 1963-66.*

Hubert Irving Beatty. *Professor of History, West Virginia State College, Institute, 1968-84.*

Bernard Winslow Beckingsale. *Former Senior Lecturer in Modern History, University of Newcastle upon Tyne, Eng.*

Samuel Flagg Bemis (d. 1973). *Sterling Professor of Diplomatic History and Inter-American Relations, Yale University, 1945-61.*

D. Mary Benson. *Writer. Author of Chief Albert Lutuli of South Africa and others.*

Norman de Mattos Bentwich (d. 1971). *Professor of International Relations, Hebrew University of Jerusalem, 1932-51.*

Marvin David Bernstein. *Emeritus Professor of History, State University of New York at Buffalo.*

Guillaume de Bertier de Sauvigny. *Professor of History, Catholic Institute of Paris, 1949-76.*

Hans H.A. Bielenstein. *Dean Lung Professor Emeritus of Chinese, Columbia University.*

Wilfred E. Binkley (d. 1965). *Professor of Political Science, Ohio Northern University, Ada.*

T.N. Bisson. *Henry Charles Lea Professor of Medieval History, Harvard University.*

Adrian David Hugh Bivar. *Emeritus Professor of Iranian Studies, School of Oriental and African Studies, University of London.*

Robert Norman William Blake, Baron Blake. *Provost, Queen's College, University of Oxford, 1968-87.*

Georges Blond (d. 1989) *Novelist and historian. Author of Pétain, 1856-1951 and others.*

Martin Blumenson. *Historian, Office of Chief of Military History, Department of the Army, Washington, D.C., 1952-67.*

Sir John Boardman. *Lincoln Professor Emeritus of Classical Art and Archaeology, University of Oxford.*

Derk Bodde. *Emeritus Professor of Chinese, University of Pennsylvania, Philadelphia.*

Robert Ralph Bolgar (d. 1985). *Fellow and Director of Studies in Modern Languages, King's College, University of Cambridge.*

Hans A. Bornewasser. *Professor at the Theologian Faculty, Catholic University of Tilburg, Neth.*

Alfredo Bosio. *Former Professor of Medieval History, University of Pavia, Italy.*

Jean Bourdon. *Emeritus Professor of Modern History, University of Nancy, Fr.*

Robert Boutruche (d. 1975). *Professor of Economic History of the Middle Ages, University of Paris, 1958-73.*

William J. Bouwsma. *Sather Professor Emeritus of History, University of California, Berkeley.*

G.W. Bowersock. *Professor of Ancient History, Institute for Advanced Study, Princeton, N.J.*

Mary Boyce. *Former Professor of Iranian Studies, School of Oriental and African Studies, University of London.*

Sir (John) Francis Boyd (d. 1995). *Political Correspondent, The Guardian (Manchester and London), 1945-72; Political Editor, 1972-75.*

John Andrew Boyle (d. 1978). *Professor of Persian Studies, Victoria University of Manchester, 1966-78.*

Ernie Bradford (d. 1986). *Author of The Wind Commands Me: A Life of Sir Francis Drake and others.*

Harold Whitman Bradley (d. 1990). *Professor of History, Vanderbilt University, Nashville, Tenn., 1954-72. Member, Tennessee House of Representatives, 1964-72.*

Robert J. Braidwood. *Emeritus Professor of Old World Prehistory, Oriental Institute, University of Chicago; Field Director, Oriental Institute Prehistoric Projects.*

Irving Brandt (d. 1976). *Member, Advisory Board, James Madison Papers, University of Chicago. Council Member, Institute of Early American History and Culture, 1959-62.*

Elias Lunn Bredsdorff. *Reader and Head, Department of Scandinavian Studies, University of Cambridge, 1960-79.*

David J. Breeze. *Chief Inspector of Ancient Monuments, Scot.*

Sidney Reed Brett. *Second Master, King Edward VI School, Nuneaton, Eng., 1921-54. Author of British History, 1485-1939; John Pym, 1583-1643; and others.*

Asa Briggs, Baron Briggs. *Provost of Worcester College, University of Oxford, 1976-91.*

Reginald Brill. *Freelance writer and historian. Author of Terror of the French: John, Lord Talbot, c. 1388-1453.*

Fawn McKay Brodie (d. 1981). *Professor of History, University of California, Los Angeles, 1971-77.*

Adam Bromke. *Professor of Political Science, McMaster University, Hamilton, Ont.*

Thomas Robert Shannon Broughton. *Paddison Professor Emeritus of Classics, University of North Carolina at Chapel Hill.*

B. Katherine Brown. *Historian.*

Delmer M. Brown. *Emeritus Professor of History, University of California, Berkeley.*

Elizabeth A.R. Brown. *Emerita Professor of History, Brooklyn College and the Graduate Center, City University of New York.*

Andrew Browning (d. 1972). *Professor of History, University of Glasgow, 1931-57.*

Eleanor Stephens Bruchey. *Seminar Associate, Columbia University.*

Peter Astbury Brunt. *Camden Professor of Ancient History, University of Oxford, 1970-82.*

Barbara Buckmaster (The Hon. Mrs. Barbara Miller) (d. 1966). *Writer on Balkan affairs. Member of the Staff, Foreign Research and Press Service, Royal Institute of International Affairs, London.*

Daniel Meredith Bueno de Mesquita (d. 1989). *Lecturer in Modern History, University of Oxford.*

Andrew Robert Burn (d. 1991). *Visiting Professor, A College Year in Athens, Inc., 1969-72. Reader in Ancient History, University of Glasgow, 1965-69.*

Sir Alan Cuthbert Burns (d. 1980). *Permanent Representative of the United Kingdom on the United Nations Trusteeship Council, 1947-56. Governor and Commander in Chief, Gold Coast, 1941-47.*

Alfred Leroy Burt (d. 1971). *Professor of History, University of Minnesota, Minneapolis, 1930-57.*

Ivor F. Burton. *Emeritus Professor of Social Policy, Bedford College, University of London.*

Claude A. Buss. *Professor of History, U.S. Naval Postgraduate School, Monterey, Calif. Emeritus Professor of History, Stanford University, Calif.*

Sir James Ramsay Montagu Butler (d. 1975). *Regius Professor of Modern History, University of Cambridge, 1947-54. Chief Historian, Official United Kingdom History of the Second World War (military series).*

Robert F. Byrnes. *Distinguished Professor of History, Indiana University, Bloomington.*

Theodore John Cadoux. *Former Senior Lecturer in Ancient History, University of Edinburgh.*

Claude Cahen (d. 1991). *Emeritus Professor of Islâmic History, University of Paris I, 1959–79.*

James Ford Cairns. *Member, Australian House of Representatives, 1955–77. Senior Lecturer in Economic History, University of Melbourne, 1951–55.*

North Callahan. *Emeritus Professor of History, New York University, New York City.*

Wilfrid Hardy Callcott (d. 1969). *Professor of History, University of South Carolina, Columbia.*

Pedro Calmon (d. 1985). *President, Brazilian Historical and Geographical Institute, Rio de Janeiro.*

George Glenn Cameron (d. 1979). *Professor of Near Eastern Cultures, University of Michigan, Ann Arbor, 1948–75; Chairman, Department of Near Eastern Languages and Literatures, 1948–71.*

Manoel Cardozo (d. 1985). *Professor of History, 1954–78; Curator, Oliveira Lima Library, Catholic University of America, Washington, D.C.*

J.M.S. Careless. *Emeritus Professor of History, University of Toronto.*

Sten C.O. Carlsson (deceased). *Professor of History, University of Uppsala, Swed.*

André Castelot. *Biographer and historical scriptwriter for radio and television.*

Frank Catania. *Freelance writer on Southeast Asia.*

John W. Caughey. *Professor of American History, University of California, Los Angeles, 1946–70.*

Raymond Cazelles. *Former Curator, Condé Museum, Chantilly, Fr.*

David B. Chan. *Professor of History, California State University, Hayward.*

Jean-Léon Charles. *Professor of Military History, Belgian Royal Military Academy, Brussels.*

Jacques Chastenet de Castaing (d. 1978). *Historian and journalist. Author of Léon Gambetta and others.*

B.D. Chattopadhyaya. *Professor of History, Jawaharlal Nehru University, New Delhi.*

Jerome Ch'en. *Emeritus Professor of East Asian History, York University, Toronto.*

Jean-Jacques Chevallier (d. 1983). *Professor of the History of Political Thought, University of Paris.*

Luciano Chiappini. *Teacher. President, Ferrarese Delegation for the History of Italy. Committeeman, Antonio Frizzi Institute for the History of Ferrara.*

Marquis William Childs (d. 1990). *Staff member, St. Louis Post-Dispatch, 1926–74; Chief, Washington Bureau, 1962–68.*

Guy Edward Farquhar Chilver (d. 1982). *Professor of Classical Studies, University of Kent at Canterbury, Eng., 1964–76.*

Tse-tung Chow. *Professor of East Asian Languages, Literature, and History, University of Wisconsin, Madison.*

Ian R. Christie. *Astor Professor Emeritus of British History, University College, University of London.*

Sima M. Ćirković. *Professor of the Medieval History of Yugoslavia, University of Belgrade.*

William Bell Clark (d. 1968). *Naval biographer. Vice President, N.W. Ayer & Son, 1939–50. Editor, Documentary Naval History of the American Revolution.*

Jesse Dunsmore Clarkson (d. 1973). *Professor of History, Brooklyn College, City University of New York, 1945–67.*

Sheldon S. Cohen. *Professor of History, Loyola University, Chicago.*

Henry Jacob Cohn. *Reader in History, University of Warwick, Coventry, Eng.*

Hugh Marshall Cole. *Military historian. Author of The Lorraine Campaign; The Ardennes: Battle of the Bulge.*

Douglas Colyer (d. 1978). *Air Marshal. Civil Aviation Representative, Western Europe, Ministry of Transport and Civil Aviation, 1952–60.*

James Richard Connor. *Executive Director, James S. Kemper Foundation, Long Grove, Ill. Emeritus Professor of History, University of Wisconsin, Whitewater; Chancellor, 1974–91.*

F. Hilary Conroy. *Emeritus Professor of Far Eastern History, University of Pennsylvania, Philadelphia.*

Sarah Gibbard Cook. *Freelance writer on history and geography.*

W. Mercer Cook (d. 1987). *U.S. Ambassador to Niger, 1961–64; to Senegal and Gambia, 1964–66. Professor and Chairman, Department of Romance Languages, Howard University, Washington, D.C., 1966–70.*

W. Ph. Coolhaas (deceased). *Professor of Colonial History, State University of Utrecht, Neth.*

J. Terry Copp. *Professor of History, Wilfrid Laurier University, Waterloo, Ont.*

James A(rthur) Corbett. *Emeritus Professor of Medieval History, University of Notre Dame, Ind.*

Cornelius P. Cotter. *Former Professor of Political Science, University of Wisconsin, Milwaukee.*

Jean Cousin (deceased). *Professor of Latin Language and Literature, University of Besançon, Fr.*

James Coyle. *Freelance writer on Vietnamese history.*

Peter Craumer. *Consultant and writer on Polish history and affairs.*

Avery Craven (d. 1980). *Professor of American History, University of Chicago, 1927–72.*

Ralph C. Croizier. *Professor of History, University of Victoria, B.C.*

John Anthony Crook. *Professor of Ancient History, University of Cambridge, 1979–84.*

François Marie-Joseph Crouzet. *Emeritus Professor of the History of Northern Europe, University of Paris IV.*

William Culican (d. 1984). *Reader in History, University of Melbourne, 1972–84.*

Noble E. Cunningham, Jr. *Curators Professor of History, University of Missouri, Columbia.*

Richard N. Current. *University Distinguished Professor Emeritus of History, University of North Carolina, Greensboro.*

Douglas Dakin. *Former Professor and Head, Department of History, Birkbeck College, University of London.*

Stephanie Mary Dalley. *Senior Research Fellow, Somerville College, Oxford; Shillito Fellow in Assyriology, Oriental Institute, University of Oxford.*

Robert V. Daniels. *Emeritus Professor of History, University of Vermont, Burlington.*

Adrien Dansette (d. 1976). *Member of the Academy of Moral and Political Sciences, Paris.*

Cuthbert Collin Davies (d. 1974). *Reader in Indian History, University of Oxford, 1936–63.*

Ernest Albert John Davies (d. 1991). *Publisher, Traffic Engineering and Control; Editor, 1960–76. Member of Parliament, 1945–59. Chairman, Labour Party Transport Committee, 1945–59.*

William Robert Davies (deceased). *Secretary, Liberal Party Organization, 1936–55.*

Warren Royal Dawson (d. 1968). *Hon. Fellow, Imperial College of Science. Hon. Member, Egypt Exploration Society.*

Istvan Deak. *Professor of History, Columbia University.*

Ann Dearden (d. 1991). *Diplomatic Correspondent, Manchester Guardian, 1943–46. Author of Jordan and others.*

Alexander De Conde. *Emeritus Professor of History, University of California, Santa Barbara.*

Juliette C. Decreus. *Former Senior Lecturer in French, Queen Mary College, University of London.*

John Coleman de Graft-Johnson (d. 1977). *Editor, Economic Bulletin of Ghana. Research Associate Professor of Economics, University of Ghana.*

Herbert Stanley Deighton. *Lecturer in International Politics, Brunel University, Uxbridge, Eng., 1967–73.*

John Duncan Martin Derrett. *Emeritus Professor of Oriental Laws, University of London.*

Ranjit Ramchandra Desai. *Agriculturist and writer. Author of Srimāna Yogi: the Life of Śivaji in Marathi and others.*

Georges Dethan. *Archivist, French Foreign Ministry Archives, Paris, 1947–88. Chief Editor, Revue d'Histoire Diplomatique.*

Jean Devisse. *Lecturer, University of Paris VIII.*

Harry T. Dickinson. *Professor of History, University of Edinburgh.*

Heide Dienst. *Professor, Institute of Austrian History Research, University of Vienna.*

Porphyrios Dikaïos (d. 1971). *Professor, Archaeological Institute, Rupert Charles University of Heidelberg, W.Ger. Director of Antiquities, Nicosia, Cyprus, 1960–63.*

Dimitrije V. Djordjevic. *Emeritus Professor of History, University of California, Santa Barbara.*

Mário José Domingues. *Author of O Marquês de Pombal and others.*

David Herbert Donald. *Charles Warren Professor of American History and Professor of American Civilization, Harvard University.*

Gordon Donaldson (d. 1993). *Professor of Scottish History and Palaeography, University of Edinburgh, 1980–82.*

Andreas Dorpalen (d. 1982). *Professor of History, Ohio State University, Columbus, 1958–78.*

Clifford Dowdey (d. 1979). *Lecturer in Creative Writing, University of Richmond, Va., 1958–69. Author of Lee and others.*

Glanville Downey. *Distinguished Professor Emeritus of History and of Classical Studies, Indiana University, Bloomington.*

Margaret Stefana Drower. *Fellow of University College, London; former Reader in Ancient History, University of London.*

Joaquin Milton Duarte, Jr. *Dom Pedro II Professor of Iberian Brazilian and Lusohispanophone African Studies, American Graduate School of International Management, Glendale, Ariz.*

Eleanor Shipley Duckett (d. 1976). *Professor of Classical Languages and Literature, Smith College, Northampton, Mass., 1928–49.*

Jack L. Dull (d. 1995). *Professor of History, University of Washington, Seattle.*

Richard S. Dunn. *Professor of History, University of Pennsylvania, Philadelphia.*

Trevor Nevitt Dupuy (d. 1995). *Colonel, U.S. Army. President and Executive Director, Historical Evaluation and Research Organization, McLean, Va., 1962–95.*

Enrique Dussel. *Professor of Ethics, National Autonomous University of Mexico, Mexico City.*

Brainerd Dyer (d. 1980). *Professor of History, University of California, Los Angeles, 1947–72.*

Denys G. Dyer. *Former Lecturer in German, University of Oxford.*

Robert Harris Dyson, Jr. *Professor of Anthropology; Curator, Near Eastern Section, University Museum, University of Pennsylvania, Philadelphia.*

David Magarey Earl. *Former Professor of History, Eastern Michigan University, Ypsilanti.*

Robert A. East. *Emeritus Professor of History, Brooklyn College, City University of New York.*

Arimichi Ebisawa (d. 1992). *Professor of History, International Christian University, Tokyo.*

W.J. Eccles. *Emeritus Professor of History, University of Toronto.*

Robert Walter Dudley Edwards (d. 1988). *Professor of Modern Irish History, University College, Dublin, National University of Ireland, 1945–79.*

Lajos Elekes. *Former Professor of the Medieval History of Hungary, Eötvös Loránd University, Budapest.*

Nikita Elisséeff. *Professor of Islamic History and Archaeology, University of Lyon II.*

Sir Ivo D'Oyly Elliott (d. 1961). *Indian Civil Service, 1906–32.*

Sir Geoffrey R. Elton (d. 1994). *Regius Professor of Modern History, University of Cambridge, 1983–88; Fellow of Clare College, Cambridge, 1954–93.*

Marcel Emerit (d. 1985). *Professor of History, University of Lille, Fr., 1964–69.*

William Richard Emerson. *Director, Franklin D. Roosevelt Library, Hyde Park, N.Y., 1974–91.*

Henrik Enander. *Former Lecturer in History, University of Stockholm.*

Jens Engberg. *Professor of History, University of Aarhus, Den.*

Philippe Erlanger (d. 1987). *Head, Artistic Exchange Department, Ministry of Foreign Affairs, Paris, 1946–68.*

Heinrich Gustav Euler. *Professor of Modern History, University of Würzburg, Ger.*

(Henry) Outram Evennett (d. 1964). *Fellow of Trinity College, Cambridge; Lecturer in History, University of Cambridge, 1930–55.*

John E. Fagg. *Emeritus Professor of History, New York University, New York City.*

Stanley Lawrence Falk. *Historical consultant. Deputy Chief Historian, Southeast Asia, U.S. Army Center of Military History, Washington, D.C., 1980–82.*

Cyril Bentham Falls (d. 1971). *Military Correspondent of The Times (London), 1939–53. Chichele Professor of the History of War, University of Oxford, 1946–53.*

Raymond Oliver Faulkner (deceased). *Fellow of University College, London; Lecturer in Ancient Egyptian, University College, University of London, 1955–67.*

Lee Nathan Feigon. *Associate Professor of History; Director, East Asian Studies, Colby College, Waterville, Maine. Staff Writer, East Asian Affairs, Encyclopædia Britannica, Chicago, 1970–73.*

Isaac M. Fein. *Emeritus Professor of Jewish History, Baltimore Hebrew College.*

John Lister Illingworth Fennell (d. 1992). *Professor of Russian, University of Oxford, 1967–85.*

Michael de Ferdinandy. *Emeritus Professor of Humanities, University of Puerto Rico, Río Piedras.*

John Ferguson (d. 1989). *President, Selly Oak Colleges, Birmingham, Eng., 1976–86. Professor, Dean, and Director of Studies in Arts, The Open University, Milton Keynes, Eng., 1969–79.*

William Ferguson. *Former Reader in Scottish History, University of Edinburgh.*

Sir James Fergusson of Kilkerran, 8th Bart. (d. 1973). *Keeper of the Records of Scotland, 1949–69.*

Ronald Whitaker Ferrier. *Assistant Professor and Head, Department of English, Pahlavi University, Iran, 1963–65.*

Charles Patrick FitzGerald (d. 1992). *Professor of Far Eastern History, Australian National University, Canberra, 1953–67.*

Russell H. Fitzgibbon (d. 1979). *Professor of Political Science, University of California, Santa Barbara, 1964–72.*

Geoffrey Bernard Abbott Fletcher (d. 1995). *Professor of Latin, University of Newcastle upon Tyne, Eng., 1963–69. Author of Annotations on Tacitus.*

Michael T. Florinsky (d. 1981). *Professor of Economics, Columbia University, 1956–63.*

David Floyd. *Former special correspondent on Communist affairs, The Daily Telegraph and The Sunday Telegraph, London.*

Philip S. Foner (d. 1994). *Professor of History, Lincoln University, Pennsylvania, 1967–79.*

Michael Richard Daniell Foot. *Professor of History, Victoria University of Manchester, 1967–73.*

William George Forrest. *Wykeham Professor Emeritus of Ancient History, University of Oxford.*

Heinrich Fraenkel (d. 1986). *Freelance writer. Author of The Other Germany; coauthor of Hermann Göring and many others.*

Enno Franzius. *Historian. Author of History of the Byzantine Empire and others.*

Lady Antonia Fraser. *Writer. Author of Mary, Queen of Scots and many others.*

Greville Stewart Parker Freeman-Grenville. *Honorary Fellow, University of York, Heslington, Eng. Professor of African History, State University of New York College at New Paltz, 1969–74.*

Frank Freidel (d. 1993). *Bullitt Professor of History, University of Washington, Seattle, 1981–86. Charles Warren Professor of American History, Harvard University, 1972–81.*

Michael Freund (d. 1973). *Professor of Political Theory and History, Christian Albrecht University of Kiel, W. Ger.*

Jean Claude Froelich (d. 1972). *Director, Center for Advanced Studies on Modern Africa and Asia, University of Paris.*

Richard N. Frye. *Aga Khan Professor Emeritus of Iranian, Harvard University.*

André Fugier. *Former Professor of Modern History, University of Lyon.*

Fujimura Michio. *Professor of History, Sophia University, Tokyo.*

Sir Roger Fulford (d. 1983). *Author of Royal Dukes and others; coeditor of The Greville Memoirs.*

Edmund Fuller. *Writer and editor. Book Reviewer, Wall Street Journal. Coeditor of Four American Biographies and others.*

Cyril John Gadd (d. 1969). *Professor of Ancient Semitic Languages and Civilizations, University of London, 1955–60. Keeper, Egyptian and Assyrian Antiquities, British Museum, London, 1948–55.*

Vivian Hunter Galbraith (d. 1976). *Regius Professor of Modern History, University of Oxford, 1947–57.*

Kenneth Garrad. *Former Professor of Spanish, Flinders University of South Australia, Bedford Park.*

Noel George Garson. *Professor of History, University of the Witwatersrand, Johannesburg.*

Raymond Leonard Garthoff. *U.S. foreign service officer (retired); U.S. Ambassador to Bulgaria, 1977–79.*

Norman Gash. *Emeritus Professor of History, University of St. Andrews, Scot.*

Deno John Geanakoplos. *Professor of History and Religious Studies, Yale University.*

Lucien Genet. *Former Inspector General of Public Instruction, Paris.*

Sir Hamilton Alexander Rosskeen Gibb (d. 1971). *University Professor and J.R. Jewett Professor of Arabic, Harvard University, 1955–64.*

Frank B. Gibney. *Vice-Chairman, Board of Editors, Encyclopædia Britannica, Inc., Chicago. Vice-Chairman, TBS-Britannica Company Ltd., Tokyo. Author of The Khrushchev Pattern and others.*

Frederick Wellington Gibson. *Professor of History, Queen's University at Kingston, Ont., 1952–85.*

Aleksander Gieysztor. *Emeritus Professor of Medieval History, University of Warsaw.*

Sara D. Gilbert. *Freelance writer.*

Robert Louis Gilmore. *Emeritus Professor of History, University of Kansas, Lawrence.*

Marija Gimbutas (d. 1994). *Professor of European Archaeology and Indo-European Studies, University of California, Los Angeles, 1963–89.*

Martin Gimm. *Professor of Sinology, University of Cologne.*

Wassil Todorov Gjuzele. *Professor of Bulgarian Medieval History, University of Sofia.*

Sir John Bagot Glubb (d. 1986). *Lieutenant General; Chief of General Staff, The Arab Legion, Amman, Jordan, 1939–56.*

Jacques Godechot (d. 1989). *Professor of Modern and Contemporary History, 1945–80; Dean, Faculty of Letters, 1961–71, University of Toulouse II, Fr.*

Ludwig von Gogolák. *Author of Csehszlovákia and others.*

Alfred Goldberg. *Senior Social Scientist, Rand Corporation, Washington, D.C., 1965–73. Chief, Current History Branch, U.S. Department of the Air Force, 1944–65.*

L. Carrington Goodrich (d. 1986). *Professor of Chinese, Columbia University, 1945–61.*

Albert Goodwin (d. 1995). *Professor of Modern History, Victoria University of Manchester, 1953–69.*

Cyrus H. Gordon. *Professor of Hebraic Studies; Director, Center for Ebla Research, New York University, New York City. Emeritus Professor of Mediterranean Studies, Brandeis University, Waltham, Mass.*

Walter Otto Julius Görlitz. *Journalist; Editorial Staff, Die Welt, Hamburg.*

Norman A. Graebner. *Emeritus Professor of Public Affairs, University of Virginia, Charlottesville.*

William Roger Graham (d. 1988). *Douglas Professor of Canadian History, Queen's University at Kingston, Ont.*

Bruce Grant (d. 1977). *Author of Isaac Hull: Captain of Old Ironsides and others.*

Michael Grant. *President and Vice-Chancellor, Queen's University of Belfast, N.Ire., 1959–66.*

Eric William Gray (d. 1990). *Lecturer in Ancient History, University of Oxford; Official Student and Tutor in Roman History, Christ Church, Oxford, 1939–77.*

Richard L. Greaves. *Professor and Chair, Department of History, Florida State University, Tallahassee.*

Constance McLaughlin Green (d. 1975). *Director, Washington History Project, American University, Washington, D.C., 1954–60. Pulitzer Prize for History, 1963.*

Fletcher Melvin Green (d. 1978). *Kenan Professor of History, University of North Carolina at Chapel Hill.*

George William Greenaway. *Senior Lecturer in History, University of Exeter, Eng., 1956–68.*

Jonas Carl Greenfield. *Professor of Ancient Semitic Languages, Hebrew University of Jerusalem.*

Richard David Greenfield. *Former Director of General Studies, University of Benin, Nigeria.*

Thomas Hoag Greer. *Emeritus Professor of Humanities, Michigan State University, East Lansing.*

John A.S. Grenville. *Professional Research Fellow, University of Birmingham, Eng.; former Professor of Modern History.*

Ian Grey. *Author of Catherine the Great; The First Fifty Years: Soviet Russia 1917–67; and others.*

Guy Thompson Griffith (d. 1985). *Laurence Reader in Classics, University of Cambridge, 1951–75; Fellow of Gonville and Caius College, Cambridge.*

Géza Grosschmid (deceased). *Professor of Economics, Duquesne University, Pittsburgh, 1955–89; Director, Institute of African Affairs, 1959–70.*

Hans G. Güterbock. *Tiffany and Margaret Blake Distinguished Service Professor Emeritus of Hittitology, Oriental Institute, University of Chicago.*

Denis Rolleston Gwynn (d. 1971). *Research Professor of Modern Irish History, University College, Cork, National University of Ireland, 1946–63.*

Richard Carleton Haines (d. 1977). *Field Architect, 1930–42 and 1949–72; Assistant Professor, 1963–71, Oriental Institute, University of Chicago.*

K.H.D. Haley. *Emeritus Professor of Modern History, University of Sheffield, Eng.*

John Whitney Hall. *Former Griswold Professor of History, Yale University.*

Theodore S. Hamerow. *Emeritus Professor of History, University of Wisconsin, Madison.*

Mary Agnes Hamilton (d. 1966). *Editor, English-Speaking World. Author of Sidney and Beatrice Webb and others.*

The Rev. Raphael Noteware Hamilton, S.J. (d. 1980). *Professor of History, Marquette University, Milwaukee, 1932–64; Archivist, 1960–73.*

Oscar J. Hammen. *Emeritus Professor of History, University of Montana, Missoula.*

Mason Hammond. *Pope Professor Emeritus of Latin Language and Literature; former Professor of Roman History, Harvard University.*

Nicholas G.L. Hammond. *Henry Overton Wills Professor Emeritus of Greek, University of Bristol, Eng.*

Ralph Hammond Innes. *Novelist and writer on history and travel. Author of The Conquistadors and many others.*

Eric Walter Handley. *Regius Professor of Greek, University of Cambridge, 1984–94.*

Cyril Francis James Hankinson (d. 1984). *Editor, Debrett's Peerage, London, 1935–62.*

Willard A. Hanna (d. 1993). *Senior Associate, Universities Field Staff International, Hanover, N.H., 1954–76.*

Sidney Harcave. *Emeritus Professor of History, State University of New York at Binghamton.*

Peter Hardy. *Former Reader in the History of Islām in South Asia, School of Oriental and African Studies, University of London.*

Claude Harmel. *Editor, Les Études Sociales et Syndicales, Paris. Former Secretary, Institute for Social History, Paris.*

John A. Harrison. *Emeritus Professor of History, University of Miami, Coral Gables, Fla. Editor, The Journal of Asian Studies, 1969–72.*

John Bennett Harrison. *Reader in the History of South Asia, School of Oriental and African Studies, University of London.*

Erich Hugo Hassinger. *Emeritus Professor of Modern History, Albert Ludwig University of Freiburg, Freiburg im Breisgau, Ger.*

Warren W. Hassler, Jr. *Emeritus Professor of American History, Pennsylvania State University, University Park.*

Ragnhild Marie Hatton (d. 1995). *Professor of International History, London School of Economics and Political Science, University of London, 1968–80.*

Alfred F. Havighurst (d. 1991). *Professor of History, Amherst College, Mass, 1954–70.*

Zenos Eric Myhren Hawkinson. *Professor of History, North Park College, Chicago.*

G.R. Hawting. *Senior Lecturer in the History of the Near and Middle East, School of Oriental and African Studies, University of London.*

Shigeru Hayashi (d. 1989). *Professor, Institute of Social Science, University of Tokyo.*

Charles W. Hayford. *Associate, Department of History, Northwestern University, Evanston, Ill., and Center for East Asian Studies, University of Chicago.*

Stephen Heder. *Freelance writer and consultant on Cambodia.*

Helmut Heiber. *Assistant, Institute for Contemporary History, Munich. Author of Joseph Goebbels and others.*

Walter Heinemeyer. *Professor of Medieval History, Philipps University of Marburg, Ger.*

Heinz Heinen. *Professor of Ancient History, University of Trier, Ger.*

Richard Hellie. *Professor of Russian History, University of Chicago.*

Charles Alistair Hennessy. *Professor of History, University of Warwick, Coventry, Eng.*

Stanislaw Herbst (d. 1973). *Professor of Pre-18th Century Polish History, University of Warsaw. President, Polish Historic Society, Warsaw.*

Hans Herzfeld (d. 1982). *Professor of Modern History, Free University of Berlin, 1950–60.*

William B. Hesseltine (d. 1963). *Professor of History, University of Wisconsin, 1940–63.*

Christopher Hibbert. *Historian and biographer. Author of Benito Mussolini; The Rise and Fall of Il Duce; and others.*

Agnes H. Hicks. *Member and Honorary Consultant on Scandinavian Affairs, Royal Institute of International Affairs.*

Jay Higginbotham. *Archivist, Mobile Municipal Archives, Ala.*

J.R.L. Highfield. *Emeritus Fellow of Merton College, Oxford; former Lecturer in Modern History, University of Oxford.*

Patrice Louis-René Higonnet. *Goelet Professor of French History, Harvard University.*

John Hugh Hill. *Emeritus Professor of Medieval History, University of Houston, Texas.*

Laurita L. Hill (deceased). *Writer and editor. Instructor in History, University of Texas, Austin, 1963–68.*

Richard Leslie Hill (d. 1996). *Professor of History, Abdullahi Bayero College, Ahmadu Bello University, Kano, Nigeria, 1968–69. Lecturer in Modern Near Eastern History, University of Durham, Eng., 1949–66.*

Thomas Hodgkin (d. 1982). *Writer. Fellow of Balliol College, Oxford; Lecturer in the Government of New States, University of Oxford, 1965–70.*

Fritz L(eo) Hoffmann. *Emeritus Professor of Latin-American History, University of Colorado, Boulder.*

Keigo Hogetsu. *Honorary Professor of Literature, University of Tokyo.*

C. Warren Hollister. *Professor of History, University of California, Santa Barbara.*

Edgar Crawshaw Holt (d. 1975). *Author and journalist. Author of The Making of Italy, 1815–1870 and others.*

J.C. Holt. *Emeritus Professor of Medieval History, University of Cambridge.*

Shan-Yüan Hsieh. *Former Assistant Professor of Philosophy, Haverford College, Pa.*

Walther C. Hubatsch (d. 1984). *Professor of Medieval and Modern History, Rhenish Friedrich Wilhelm University of Bonn.*

Jean Hubert. *Emeritus Professor of Medieval Archaeology, École Nationale des Chartes (School of Paleography), Paris.*

Charles O(scar) Hucker. *Emeritus Professor of Chinese and of History, University of Michigan, Ann Arbor.*

Harri Llwyd Hudson-Williams. *Emeritus Professor of Greek, University of Newcastle upon Tyne, Eng.*

Jean-Louis Huot. *Professor of Oriental Archaeology, University of Paris I.*

Joel Hurstfield (d. 1980). *Astor Professor of English History, University College, University of London, 1962–79.*

Mahmud Husain (d. 1975). *Vice-Chancellor, University of Karāchi, Pak.*

Joan Mervyn Hussey. *Emeritus Professor of History, Royal Holloway College, University of London.*

Richard Wyatt Hutchinson (d. 1970). *Lecturer in Classical Archaeology, University of Cambridge, 1952–55, and University of Liverpool, 1948–57.*

William Thomas Hutchinson (d. 1976). *Preston and Sterling Morton Professor of American History, University of Chicago, 1955–62.*

Nobutaka Ike. *Emeritus Professor of Political Science, Stanford University, Calif.*

Halil Inalcik. *University Professor Emeritus of History, University of Chicago.*

Denis Liddell Ireland (d. 1974). *Senator, Republic of Ireland, 1948–51. Author of Patriot Adventurer and others.*

Fahir İz. *Professor of Turkish Literature, Boğaziçi University, Istanbul.*

Wilbur R. Jacobs. *Emeritus Professor of History, University of California, Santa Barbara.*

D. Clayton James. *Biggs Professor of Military History, Virginia Military Institute, Lexington.*

Marius B. Jansen. *Emeritus Professor of History, Princeton University.*

Wilhelmina Feemster Jashemski. *Emeritus Professor of Ancient History, University of Maryland, College Park.*

Yette Jeandet. *Former Editor, Literary News, Bayard-Presse, Paris. Author of Blanche de Castille, reine de l'unité française and others.*

Barbara Jelavich (d. 1995). *Distinguished Professor of History, Indiana University, Bloomington, 1984–93.*

Dafydd Jenkins. *Former Reader in Law, University College of Wales, Aberystwyth, University of Wales.*

Robert Thomas Jenkins (d. 1969). *Professor of Welsh History, University College of North Wales, Bangor, University of Wales, 1945–48.*

Rt. Hon. Roy Jenkins. *Member of Parliament. President of the European Commission, 1977–81. Chancellor of the Exchequer, 1967–70.*

John J. Johnson. *Emeritus Professor of History, Stanford University, Calif. Author of Political Change in Latin America and others.*

Robert Carl Johnson. *Former Associate Professor of History, Temple University, Philadelphia.*

Arnold Hugh Martin Jones (d. 1970). *Professor of Ancient History, University of Cambridge, 1951–70.*

Frits de Jong. *Professor of Modern and Contemporary History, University of Amsterdam.*

Adriaan G. Jongkees. *Former Professor of Medieval History, State University of Groningen, Neth.*

Karl H.E. Jordan (d. 1984). *Professor of Medieval and Modern History, Christian Albrecht University of Kiel, W.Ger.*

Albert Jourcin. *Professor agrégé honoraire. Author of Les Médicis and others.*

Eino Kaarlo Ilmari Jutikkala. *Professor of Finnish History, University of Helsinki, 1947–50; 1954–74.*

Wadie Jwaideh. *Emeritus Professor of History and Arabic, Indiana University, Bloomington.*

Walter Emil Kaegi, Jr. *Professor of Byzantine and Roman History, University of Chicago.*

Nobuo Kanda. *Emeritus Professor of East Asian History, Meiji University, Tokyo.*

Robert A. Kann (d. 1981). *Professor of History, Rutgers University, New Brunswick, N.J., 1956–76.*

Enver Ziya Karal. *President, Turkish Historical Society. Former Professor of Contemporary History, University of Ankara.*

Thomas L(indas) Karnes. *Emeritus Professor of History, Arizona State University, Tempe.*

Hugh Francis Kearney. *Former Richard Pares Professor of History, University of Edinburgh.*

Benjamin Keen. *Emeritus Professor of History, Northern Illinois University, De Kalb.*

John L.H. Keep. *Emeritus Professor of Russian History, University of Toronto.*

Harper Kelley (deceased). *Head of Research, National Center for Scientific Research, Paris. Head, Department of Prehistory, Musée de l'Homme, Paris.*

Jerold Kellman. *Freelance writer.*

Annajane Kennard. *Former Librarian, Straits Times Press, Malaysia.*

John P. Kenyon (d. 1996). *Joyce and Elizabeth Hall Distinguished Professor of Early Modern British History, University of Kansas, Lawrence, 1987–94. Professor of Modern History, University of St. Andrews, Scot., 1981–87.*

Dame Kathleen Mary Kenyon (d. 1978). *Principal, St. Hugh's College, University of Oxford, 1962–73. Director, British School of Archaeology in Jerusalem, 1951–66.*

George Briscoe Kerferd. *Emeritus Professor of Greek, Victoria University of Manchester.*

Tarif Khalidi. *Professor of History and Archaeology, American University of Beirut.*

Stefan Kieniewicz. *Emeritus Professor of 19th- and 20th-Century Polish History, University of Warsaw.*

P.D. King. *Senior Lecturer in History, University of Lancaster, Eng.*

Jay Kinsbruner. *Professor of History, Queens College, City University of New York.*

Russell Amos Kirk (d. 1994). *Author and lecturer. Editor, The University Bookman, 1970–94.*

Donald W. Klein. *Lecturer in Political Science, Tufts University, Medford, Mass.*

Wilfrid F. Knapp. *Fellow and Tutor in Politics, St. Catherine's College, Oxford; Lecturer in Politics, University of Oxford.*

George Harmon Knoles. *Margaret Byrne Professor Emeritus of American History, Stanford University, Calif.*

Bernhard Knollenberg (d. 1973). *Fellow of Saybrook College, Yale University; Yale Librarian, 1938–44. Author of Origin of the American Revolution and others.*

Lionel Kochan. *Bearsted Reader in Jewish History, University of Warwick, Eng.*

Helmut Georg Koenigsberger. *Emeritus Professor of History, King's College, University of London.*

Hans Kohn (d. 1971). *Professor of History, City College, City University of New York, 1949–62.*

Frank P. Kolb. *Professor of Ancient History, Eberhard Karl University of Tübingen, Ger.*

E.H. Kossmann. *Emeritus Professor of Modern History, State University of Groningen, Neth.*

E.A. Kracke, Jr. (d. 1976). *Professor of Chinese Literature and Institutions, University of Chicago, 1960–73.*

Carl H(ermann) Kraeling (d. 1966). *Professor of Archaeology, 1950–62; Director, Oriental Institute, 1950–60, University of Chicago.*

Daniel Wilhelmus Kruger. *Former Professor of History, University of the Transkei, Umtata.*

Hyman Kublin. *Emeritus Professor of History, Brooklyn College, City University of New York.*

Harold Kurtz (d. 1972). *Author of The Trial of Marshal Ney: His Last Years and Death and others.*

Tadachika Kuwata. *Emeritus Professor of Japanese History, Kokugakuin University, Tokyo.*

Jean Lacouture. *Former Professor, Institute for Political Studies, University of Paris. Adviser, Éditions du Seuil, Paris.*

Jorgen Laessoe (d. 1993). *Professor of Assyriology, University of Copenhagen.*

Robert George Dalrymple Laffan (d. 1972). *University Lecturer, University of Cambridge, 1927–53; Fellow of Queen's College, Cambridge.*

Charles-André Laffargue. *General, French Army (retired). Author of Foch et la Bataille de 1918 and others.*

Ursula Schaefer Lamb (d. 1996). *Professor of History, University of Arizona, Tucson, 1974–85.*

Gustave Lanctot (d. 1975). *Dominion Archivist and Deputy Minister of the Canadian Archives, 1937–48.*

Aubrey C(hristian) Land. *Research Professor of History, University of Georgia, Athens.*

Yvonne Lanhers. *Curator, National Archives, Paris.*

Taft Alfred Larson. *Member, House of Representatives, Wyoming State Legislature. William Robertson Coe Distinguished Professor Emeritus of American Studies, University of Wyoming, Laramie.*

Agnes M.C. Latham. *Former Reader in English, Bedford College, University of London.*

Hugh Talmage Lefler. *Kenan Professor Emeritus of History, University of North Carolina at Chapel Hill.*

George Alexander Lensen (d. 1980). *Professor of History, Florida State University, Tallahassee, 1959–80.*

Alexander Marie Norbert Lernet-Holenia (d. 1976). *Novelist and playwright. Author of Prinz Eugen and others.*

Jacques Levron. *Honorary Chief Curator, Archives of France, Paris.*

Reuben Levy (d. 1966). *Professor of Persian, University of Cambridge, 1950–58.*

Bernard Lewis. *Cleveland E. Dodge Professor of Near Eastern Studies, Princeton University.*

David Malcolm Lewis (d. 1994). *Professor of Ancient History, University of Oxford, 1985–94.*

Lucjan Ryszard Lewitter. *Professor and Head, Department of Slavonic Studies, University of Cambridge; Fellow of Christ's College, Cambridge.*

K.J. Leyser (d. 1992). *Chichele Professor of Medieval History, University of Oxford, 1984–88.*

Alphons Lhotsky (d. 1968). *Professor of Austrian History, University of Vienna, 1951–68.*

Li Chi. *Emeritus Director, Institute of History and Philology, Academia Sinica, Taipei. Director of Excavations at An-yang.*

Heinz Lieberich. *General Director, Bavarian State Archives, Munich.*

Kenneth G. Lieberthal. *Arthur F. Thurnau Professor and Professor of Political Science; Research Associate, Center for Chinese Studies, University of Michigan, Ann Arbor.*

Hans Liebeschütz (d. 1978). *Reader in Medieval History, University of Liverpool, 1955–59.*

Chan Lien. *Professor of Political Science, National Taiwan University, Taipei.*

Adolf Lippold. *Professor of History, University of Regensburg, Ger.*

Donald P. Little. *Professor, Institute of Islamic Studies, McGill University, Montreal.*

Harold V. Livermore. *Emeritus Professor of Spanish and Portuguese, University of British Columbia, Vancouver.*

Charles Christopher Lloyd (d. 1986). *Professor of History, Royal Naval College, Greenwich, Eng., 1962–66.*

Robert Bruce Lloyd. *Mary Frances Williams Professor of Humanities, Randolph-Macon Woman's College, Lynchburg, Va.*

Jung-pang Lo (d. 1981). *Professor of History, University of California, Davis, 1969–76.*

Henry Cabot Lodge (d. 1985). *Personal Envoy of the President to the Vatican, 1970–77. United States Ambassador to South Vietnam, 1963–64, 1965–67. Representative of the United States to the United Nations, 1953–60.*

Leo Loewenson. *Deputy Librarian and Tutor in Russian History, School of Slavonic Studies, University of London, 1939–56.*

Antonino Lombardo (d. 1989). *Inspector General of National Archives, Rome. Professor of the Study of Archives, University of Rome.*

Stephen Hemsley Longrigg (d. 1979). *Historian and orientalist. Author of Four Centuries of Modern Iraq and others.*

Philip Longworth. *Professor of History, McGill University, Montreal.*

Robert Sabatino Lopez (d. 1986). *Professor of History, Yale University, 1955–71.*

Donald William Lucas (d. 1985). *P.M. Laurence Reader in Classics, University of Cambridge, 1952–69.*

Afaf Lutfi al-Sayyid Marsot. *Professor of History, University of California, Los Angeles.*

James G. Lydon. *Professor of History, Duquesne University, Pittsburgh.*

John Lynch. *Emeritus Professor of Latin American History, University of London.*

Carlile Aylmer Macartney (d. 1978). *Research Fellow, All Souls College, University of Oxford, 1936–65. Montagu Burton Professor of International Relations, University of Edinburgh, 1951–57.*

Charles A. McClelland. *Emeritus Professor of International Relations, University of Southern California, Los Angeles.*

Alexander Hugh McDonald (d. 1979). *Lecturer in Ancient History, University of Cambridge, 1952–73.*

Forrest McDonald. *Professor of History, University of Alabama, University.*

Robert Brendan McDowell. *Associate Professor of History, Trinity College, University of Dublin.*

Thomas F. McGann (d. 1982). *Professor of History, University of Texas at Austin.*

Daniel Doyle McGarry. *Professor of Medieval History, St. Louis University, Mo.*

Clarence Fredric McIntosh (d. 1991). *Professor of History, California State University, Chico.*

Denis Mack Smith. *Extraordinary Fellow, Wolfson College, University of Oxford; Senior Research Fellow, All Souls College, Oxford, 1962–87.*

Edward Anthony MacLysaght (d. 1986). *Chairman, Irish Manuscripts Commission, 1956–73. Keeper of Manuscripts, National Library of Ireland, 1949–55.*

Philip Magnus (Sir Philip Magnus-Allcroft) (d. 1988). *Author of Kitchener and others.*

Michael Edward Mallett. *Professor of History, University of Warwick, Eng.*

Sir Max Mallowan (d. 1978). *Professor of Western Asiatic Archaeology, University of London, 1947–62. President, British School of Archaeology in Iraq, 1970–78. Archaeologist on staff of the British Museum Expedition to Nineveh, 1931–32; later led many other archaeological expeditions.*

William Manchester. *Adjunct Professor of History; Writer-in-Residence, Wesleyan University, Middletown, Conn.*

Robert Mandrou (d. 1984). *Professor of History, University of Paris X.*

Golo Mann (d. 1994). *Writer. Professor of History and Political Science, Technical University, Stuttgart, W.Ger., 1960–64.*

(Philip) Nicholas Seton Mansergh (d. 1991). *Smuts Professor of the History of the British Commonwealth, University of Cambridge, 1953–70; Master of St. John's College, Cambridge, 1969–79.*

Fosco Maraini. *Writer. Former Lecturer in Japanese, University of Florence.*

Umberto Marcelli. *Former Lecturer in History, University of Bologna, Italy.*

The Rev. Germain P. Marc'hadour. *Professor of Philology, Catholic University of the West, Angers, Fr.*

John Marlowe. *Freelance writer. Author of Anglo-Egyptian Relations, 1800–1953; Cromer in Egypt; and others.*

Leopold Marquard (deceased). *Publisher. President, South African Institute of Race Relations, 1957–58, 1968. Author of The Story of South Africa and others.*

P.J. Marshall. *Rhodes Professor of Imperial History, King's College, University of London.*

Thomas Powderly Martin (d. 1963). *Assistant Chief and Acting Chief, Manuscript Division, Library of Congress, 1928–48.*

J. Alden Mason (d. 1967). *Curator, American Section, University Museum, University of Pennsylvania, 1926–55.*

Paul T. Mason. *Professor of History, Duquesne University, Pittsburgh.*

Philip Mason. *Writer. Director, Institute of Race Relations, London, 1958–69. Indian Civil Service, 1928–47.*

Donald Campbell Charles Masters. *Emeritus Professor of Canadian History, University of Guelph, Ont.*

Gerhard Strassmann Masur (d. 1975). *Professor of History, Sweet Briar College, Lynchburg, Va., 1948–66.*

The Most Rev. David Mathew (d. 1975). *Archbishop of Apamea; Assistant at the Pontifical Throne. Author of James I.*

Therkel Mathiassen (d. 1967). *Curator, Prehistoric Department, National Museum, Copenhagen.*

Neville Maxwell. *Senior Research Officer, Institute of Commonwealth Studies, University of Oxford. South Asia correspondent, The Times (London), 1959–67.*

Robert Douthat Meade (d. 1974). *Professor of History, Randolph-Macon Woman's College, Lynchburg, Va., 1939–71.*

Russell Meiggs (d. 1989). *Fellow of Balliol College, Oxford; Lecturer in Ancient History, University of Oxford, 1939–70.*

Julian Louis Meltzer (d. 1977). *Executive Vice-Chairman, Yad Chaim Weizmann National Memorial, and Director, Weizmann Archives, Rehovot, Israel, 1966–75.*

Lucy Shoe Meritt. *Archaeologist. Visiting Scholar, University of Texas at Austin. Editor of Publications, American School of Classical Studies at Athens, 1950–72. Member, Institute for Advanced Study, Princeton, N.J., 1948–73.*

Robert Merie. *Novelist. Author of Ahmed Ben Bella and others.*

Barbara G. Mertz. *Historian and writer. Author of Temples, Tombs and Hieroglyphs and others.*

John Callan James Metford. *Emeritus Professor of Spanish, University of Bristol, Eng.*

Franz H. Michael (d. 1992). *Professor of Far Eastern History and International Affairs, George Washington University, Washington, D.C., 1964–77.*

Hanns Leo Mikoletzky (d. 1978). *General Director, Austrian State Archives, Vienna. Professor of History, University of Vienna.*

Vladimir F. Minorsky (d. 1966). *Professor of Persian, University of London, 1938–44. Fellow of the British Academy, 1943–66.*

Mairin Mitchell. *Freelance writer. Author of The Odyssey of Acurio Who Sailed with Magellan and others.*

Nancy Mitford (d. 1973). *Writer. Author of Madame de Pompadour and others.*

Joel Mokyr. *Robert H. Strotz Professor of Arts and Sciences; Professor of Economics and History, Northwestern University, Evanston, Ill.*

Michel J. Mollat. *Emeritus Professor of History, University of Paris.*

Arnaldo Dante Momigliano (d. 1987). *Alexander White Visiting Professor, University of Chicago, 1975–87. Professor of Ancient History, University College, University of London, 1951–75.*

Nicholas Ivan Momtchiloff (d. 1964). *Economic Adviser, Industrial and Commercial Finance Corporation, London.*

The Rev. Jacques Monet, S.J. *President, University of Sudbury, Ont.*

Georges Mongrédien (d. 1980). *Historian. Director of the Municipal Council of Paris and General Council of the Seine, 1947–67.*

Gaston Monnerville (d. 1991). *Member, Constitutional Council of France, 1974–83. President, Senate of France, 1958–68.*

The Rev. Joseph Nestor Moody (d. 1994). *Professor of French History, Catholic University of America, Washington, D.C., 1965–75.*

Frank R. Moraes (d. 1974). *Editor in Chief, The Indian Express, New Delhi, 1957–72.*

Dale Lowell Morgan (d. 1971). *Historian. Specialist, Bancroft Library, University of California, Berkeley.*

Donald R. Morris. *Publisher, Donald R. Morris Newsletter, Houston, Texas.*

John Robert Morris (d. 1977). *Senior Lecturer in Ancient History, University College, University of London.*

Rudolf Morsey. *Professor of Modern History, Postgraduate School for Administrative Sciences, Speyer, Ger.*

Louis Morton (d. 1976). *Daniel Webster Professor of History, Dartmouth College, Hanover, N.H., 1968–76.*

William Lewis Morton (d. 1980). *Vanier Professor of Canadian History, Trent University, Peterborough, Ont., 1969–75.*

Leonard Mosley (d. 1992). *Author of Curzon: The End of an Epoch and others.*

W.E. Mosse. *Emeritus Professor of European History, University of East Anglia, Norwich, Eng.*

Charles Loch Mowat (d. 1970). *Professor of History, University College of North Wales, Bangor, University of Wales, 1958–70.*

Claudius Cornelius Müller. *Head, East Asian Department, Museum of Ethnology, Berlin.*

Stephanie Mullins. *Freelance writer.*

Joan Margaret Munn-Rankin (d. 1981). *Lecturer in Near Eastern History, University of Cambridge, 1949–81.*

Jean Mary Munro (Jean Dunlop). *Author of Clan Mackenzie; Clan Gordon; and others.*

Peter Munz. *Emeritus Professor of History, Victoria University of Wellington, N.Z.*

James J. Murphy. *Emeritus Professor of Rhetoric, University of California, Davis.*

Raymond Muse. *Professor and Chairman, Department of History, Washington State University, Pullman, 1956–79.*

Alexander Reginald Myers (d. 1980). *Professor of Medieval History, University of Liverpool, 1967–80.*

Keiji Nagahara. *Professor of History, Hitotsubashi University, Tokyo.*

A.K. Narain. *Professor of History and Indian Studies, University of Wisconsin, Madison.*

Herbert Blair Neatby. *Professor of History, Carleton University, Ottawa.*

Allan Nevins (d. 1971). *Historian. Senior Research Associate, Henry E. Huntington Library and Art Gallery, San Marino, Calif., 1958–69. Dewitt Clinton Professor of History, Columbia University, 1931–58.*

Herbert G. Nicholas. *Rhodes Professor Emeritus of American History and Institutions, University of Oxford.*

Roy Franklin Nichols (d. 1973). *Professor of History; Vice-Provost, 1953–66; and Dean of the Graduate School of Arts and Sciences, 1952–66, University of Pennsylvania, Philadelphia.*

Donald MacGillivray Nicol. *Koraës Professor Emeritus of Byzantine and Modern Greek History, Language, and Literature, King's College, University of London. Director, Gennadius Library, American School of Classical Studies at Athens, 1989–92.*

Louis Nicolas. *Former Professor of Naval History, Naval School, Lanvéoc-Poulmic, Fr.*

Lennart T. Norman. *Archivist and historian.*

John Julius Cooper, 2nd Viscount Norwich. *Writer and broadcaster. Author of The Normans in the South; The Kingdom in the Sun.*

Charles E. Nowell (deceased). *Professor of History, University of Illinois at Urbana-Champaign.*

Russel Blaine Nye (d. 1993). *Distinguished Professor of English, Michigan State University, East Lansing, 1965–79.*

Conor Cruise O'Brien. *Pro-Chancellor, University of Dublin. Editor in Chief, The Observer, London, 1978–81. Member, Seanad Éireann, Dublin, 1977–79; Dáil Éireann, 1969–77.*

Daniel Patrick O'Connell (d. 1979). *Chichele Professor of International Law, University of Oxford, 1972–79.*

Zoé Oldenbourg-Idalie. *Novelist and freelance writer. Author of Catherine de Russie and others.*

Roland Anthony Oliver. *Professor of the History of Africa, School of Oriental and African Studies, University of London, 1963–86.*

Daria Olivier. *Writer, translator, book reviewer, and historian. Author of Alexandre I^{er} and others.*

William J. O'Malley. *Research Fellow on Political and Social Change, Research School of Pacific Studies, Australian National University, Canberra.*

Farouk Omar. *Professor of History, College of Arts, University of Baghdad, Iraq.*

Francis D. Ommanney (d. 1980). *Reader in Marine Biology, University of Hong Kong, 1957–60.*

George Coleman Osborn. *Emeritus Professor of History and Social Sciences, University of Florida, Gainesville.*

John W. Osborne. *Emeritus Professor of History, Rutgers University, New Brunswick, N.J.*

Andrei Otetea (d. 1977). *Director, Institute of History, Academy of the Socialist Republic of Romania, Bucharest. Professor of Medieval Universal History, University of Bucharest.*

Marcel Pacaut. *Emeritus Professor of the History of the Middle Ages; Emeritus Director, Institute of Political Studies, University of Lyon.*

Joseph Howard Parks. *Emeritus Professor of History, University of Georgia, Athens.*

V.J. Parry (d. 1974). *Reader in the History of the Near and Middle East, School of Oriental and African Studies, University of London.*

Vladimir T. Pashuto (d. 1983). *Professor, Institute of History of the U.S.S.R., Academy of Sciences of the U.S.S.R., Moscow.*

Hans Patze. *Professor of German History; Director, Institute for Historical Research, Georg August University of Göttingen, Ger.*

George M. Paul. *Professor of Classics, McMaster University, Hamilton, Ont.*

Ante S. Pavelić. *Author of Dr. Ante Trumbić: Problemi hrvatsko-srpskih odnosa and others.*

Stanley G. Payne. *Hilldale-Jaume Vicens Vives Professor of History, University of Wisconsin, Madison.*

H.F. Pearson (deceased). *Author of A Popular History of Singapore; This Other India: A Biography of Sir Thomas Stamford Raffles.*

Howard Henry Peckham (d. 1995). *Director, William L. Clements Library of Americana; Professor of History, University of Michigan, Ann Arbor, 1953–77.*

Roger Pélissier (d. 1972). *Assistant Director, Centre for Far East Documentation, École Pratique des Hautes Études (Institute for Advanced Research), Paris.*

D.H. Pennington. *Fellow and Tutor in History, Balliol College, Oxford, 1965–82; former Lecturer in Modern History, University of Oxford.*

Dame Margery Perham (d. 1982). *Fellow of Nuffield College, Oxford, 1939–63; Reader in Colonial Administration, University of Oxford, 1939–48.*

Luis Pericot García (d. 1978). *Professor of Prehistory, University of Barcelona, Spain.*

Régine Pernoud. *Keeper, Joan of Arc Centre, Orléans, Fr.*

Stewart Henry Perowne (d. 1989). *Orientalist, historian, and lecturer. Author of The Life and Times of Herod the Great and others.*

Charles-Edmond Perrin (d. 1974). *Member, Institute of France. Professor of Medieval History, University of Paris, 1937–58.*

Jean Perrot. *Director of the French Archaeological Delegation in Iran.*

Edward Pessen (d. 1992). *Distinguished Professor of History, Baruch College and the Graduate Center, City University of New York, 1972–92.*

Ann Petry. *Novelist. Author of Harriet Tubman: Conductor on the Underground Railroad and others.*

Edward Hake Phillips. *Bryan Professor of History, Austin College, Sherman, Texas.*

Robert Pick (d. 1978). *Freelance writer and editor. Author of Empress Maria Theresa.*

John Whitney Pickersgill. *President, Canadian Transport Commission, Ottawa, 1967–72. Member, House of Commons, Parliament of Canada, 1953–67.*

Dorothy M. Pickles (d. 1994). *Writer, lecturer, and broadcaster. Author of The Fifth French Republic; The Government and Politics of France; and others.*

Thomas Jones Pierce (deceased). *Professor of Medieval Welsh History, University College of Wales, Aberystwyth.*

Josephine Ketcham Piercy. *Emeritus Professor of English, Indiana University, Bloomington.*

Francis Stewart Gilderoy Piggott (d. 1966). *Major General, British Army. Author of Broken Thread; The Elements of Soshō.*

Stuart Piggott (d. 1996). *Abercromby Professor of Prehistoric Archaeology, University of Edinburgh, 1946–77.*

Richard E. Pipes. *Frank B. Baird, Jr., Professor of History, Harvard University.*

Richard Pittioni (d. 1985). *Emeritus Professor of Prehistory and Protohistory, University of Vienna.*

Sir John Plumb. *Master of Christ's College, Cambridge, 1978–82; Professor of Modern English History, University of Cambridge, 1966–74.*

Tom Pocock. *Special writer, Evening Standard, London, 1982–88; Defense Correspondent, 1960–73; Travel Editor, 1973–82.*

Jan J. Poelhekke. *Emeritus Professor of Modern History, Catholic University of Nijmegen, Neth.*

Forrest C. Pogue (d. 1996). *Director, Dwight D. Eisenhower Institute for Historical Research, Smithsonian Institution, Washington, D.C., 1974–84.*

Frederik Pohl. *Author of Tiberius (under the pseudonym Ernst Mason) and of many works of science fiction.*

Ernesto Pontieri (deceased). *Professor of Medieval and Modern History, University of Naples.*

Gary William Poole. *Associate Editor, Encyclopædia Britannica, Chicago, 1970–72.*

The Rev. Stanley Burke-Roche Poole. *Vicar of Littlebourne, Eng., 1948–70. Former Assistant Editor, Debreit's Peerage.*

Ismail K. Poonawala. *Professor of Arabic and Islāmic Studies, University of California, Los Angeles.*

Rollie Edward Poppino. *Emeritus Professor of History, University of California, Davis.*

George Richard Potter (d. 1981). *Professor of Medieval History, University of Sheffield, Eng.*

Heinrich Potthoff. *Contributor, Commission for the History of Parliamentarism and Political Parties, Bonn.*

Dimitris Pournaras. *Former Publisher and Editor of Eleutheros (newspaper), Athens. Former Chairman, Greek Broadcasting Corporation.*

Helmut Preidel. *Historian. Author of Handel und Handwerk im frühgeschichtlichen Mitteleuropa and others.*

Morgan Philips Price (d. 1973). *Member of Parliament, 1929–31 and 1935–59. Author of A History of Turkey and others.*

Thomas Brynmor Pugh. *Reader in History, University of Southampton, Eng.*

Edwin G. Pulleyblank. *Emeritus Professor of Chinese, University of British Columbia, Vancouver.*

Baij Nath Puri. *Emeritus Professor of Ancient Indian History and Archaeology, University of Lucknow, India.*

Sergei Germanovich Pushkarev. *Historian. Author of The Emergence of Modern Russia, 1801–1917 and others.*

Robert S. Quimby. *Emeritus Professor of Humanities, Michigan State University, East Lansing.*

Robert Emmett Quirk. *Emeritus Professor of History, Indiana University, Bloomington.*

Horst Rabe. *Professor of History, University of Constance, Ger.*

Hassanein Muhammad Rabie. *Professor of History, University of Cairo.*

Sh. Abdur Rashid. *Director, Historical Research Institute; Head, Department of History, University of the Punjab, Lahore, Pak., 1960–65.*

John Lang Rawlinson. *Professor of History, Hofstra University, Hempstead, N.Y.*

Philip S. Rawson (d. 1995). *Dean, School of Art and Design, Goldsmiths' College, London, 1981–84. Curator, Gulbenkian Museum of Oriental Art and Archaeology, University of Durham, Eng., 1960–79.*

Donald Read. *Professor of Modern English History, University of Kent at Canterbury, Eng.*

Ann Lindsey Reber. *Researcher, Department of History, Duke University, Durham, N.C.*

Thomas C. Reeves. *Professor of History, University of Wisconsin, Parkside.*

Juan Reglá (d. 1973). *Professor of Modern History, University of Valencia, Spain.*

Kurt Reindel. *Professor of History, University of Regensburg, Ger.*

Marcel Reinhard (d. 1973). *Professor of History, University of Paris.*

Robert Vincent Remini. *Professor of History, University of Illinois, Chicago.*

Johannes M. Renger. *Professor of Assyriology, Free University of Berlin, West Berlin.*

Yves Renouard (d. 1965). *Professor of Medieval History, University of Paris.*

Frank E. Reynolds. *Professor of Buddhist Studies and History of Religions, University of Chicago.*

Edward J.M. Rhoads. *Associate Professor of History, University of Texas at Austin.*

Gotthold K.S. Rhode. *Emeritus Professor of East European and Russian History, Johannes Gutenberg University of Mainz, Ger.*

Nicholas V. Riasanovsky. *Sidney Hellman Ehrman Professor of European History, University of California, Berkeley.*

Jean B. Richard. *Honorary Dean, Faculty of Letters and Human Sciences, University of Dijon, Fr.*

Sir Ian Archibald Richmond (d. 1965). *Professor of the Archaeology of the Roman Empire, University of Oxford, 1956–65.*

C.T. Ritchie. *Historian, writer, and artist. Author of The First Canadian: The Story of Champlain and others.*

Raymond Ritter (d. 1974). *Attorney. Editor in Chief of the review Pyrénées. Author of Henry IV lui-même.*

Helen Anne B. Rivlin. *Emerita Professor of History, State University of New York at Binghamton.*

Nesca A. Robb (d. 1976). *Freelance writer and lecturer, Author of William of Orange: A Personal Portrait and others.*

Michael Roberts. *Professor of Modern History, Queen's University of Belfast, N.Ire., 1954–73.*

Edgar Eugene Robinson (d. 1977). *Margaret Byrne Professor of American History, Stanford University, Calif., 1931–52.*

George Clarence Robinson (d. 1976). *Professor of Political Science, University of Northern Iowa, Cedar Falls.*

George William Robinson. *Professor of History, Eastern Kentucky University, Richmond.*

Michael Roe. *Professor of History, University of Tasmania, Hobart, Australia.*

William R. Roff. *Professor of History, Columbia University.*

Helmuth Rogge. *Chief Archivist, National Records Office, Potsdam, Ger., 1921–45.*

Andrew Frank Rolle. *Robert Glass Cleland Professor of History, Occidental College, Los Angeles.*

Hans Roos (d. 1984). *Professor of East European History, University of the Ruhr, Bochum, W.Ger.*

Eugene Holloway Roseboom, Sr. *Emeritus Professor of History, Ohio State University, Columbus.*

Henry Godfrey Roseveare. *Professor of History, King's College, University of London.*

Ralph J. Roske. *Professor of History, University of Nevada, Las Vegas.*

C.D. Ross (d. 1986). *Professor of Medieval History, University of Bristol, Eng.*

Stanley Robert Ross (d. 1985). *Professor of History, University of Texas at Austin, 1968–85.*

Emanuel Rostworowski. *Professor of Modern History, Historical Institute, Polish Academy of Sciences, Cracow.*

Gordon Oliver Rothney. *Professor of History, University of Manitoba, Winnipeg, 1970–79.*

Jean Pierre Rouch. *Director of Research, National Centre for Scientific Research, Paris.*

John A. Rowe. *Associate Professor of African History, Northwestern University, Evanston, Ill.*

Herbert H. Rowen. *Emeritus Professor of History, Rutgers University, New Brunswick, N.J.*

Nicolai Rubinstein. *Emeritus Professor of History, Westfield College, University of London.*

Sir Peter Edward Russell. *King Alfonso XIII Professor Emeritus of Spanish Studies, University of Oxford; Emeritus Fellow of Exeter College, Oxford.*

Nils Göran Rystad. *Professor of History, University of Lund, Swed.*

Emilio Sáez (d. 1988). *Professor of Medieval Spanish History, University of Barcelona, Spain, 1959–78. Professor of Medieval History, University of Madrid, 1980–86.*

Leland Livingston Sage (d. 1989). *Emeritus Professor of History, University of Northern Iowa, Cedar Falls, 1932–67.*

Henry W.F. Saggs. *Emeritus Professor of Semitic Languages, University College, Cardiff, University of Wales.*

Robert St. John. *Journalist, lecturer, and foreign affairs radio commentator. Author of The Boss and others.*

Edward Togo Salmon (d. 1988). *Messecar Professor of History, McMaster University, Hamilton, Ont., 1954–73.*

Theodore Saloutos (d. 1980). *Professor of History, University of California, Los Angeles, 1956–78.*

Roger M. Savory. *Emeritus Professor of Middle East and Islamic Studies, University of Toronto.*

Claude Frédéric Armand Schaeffer (d. 1982). *Professor of the Archaeology of Western Asia, College of France, Paris, 1954–69. Director of the French Archaeological Expeditions to Ras Shamra-Ugarit, Syria and Enkomi-Alasia, Cyprus.*

Leonard Bertram Schapiro (d. 1983). *Professor of Political Science (Russian Studies), London School of Economics and Political Science, University of London, 1963–75.*

Theodor Schieffer. *Professor of Medieval and Modern History, University of Cologne.*

Franz-Josef Schmale. *Professor of Medieval History, University of the Ruhr, Bochum, Ger.*

Karl Michael Schmitt. *Professor of Government, University of Texas at Austin.*

Ronald Milton Schneider. *Professor of Political Science, Queens College, City University of New York.*

Walter V. Scholes (d. 1975). *Professor of History, University of Missouri, Columbia, 1954–75.*

Friedrich Schreyvogel (d. 1976). *Novelist and freelance writer. Vice-Director, Vienna Burgtheater, 1954–59.*

Alvin J. Schumacher. *Author of Thunder on Capitol Hill: The Life of Chief Justice Roger B. Taney.*

Lee Schwartz. *Freelance writer and consultant on Polish history.*

Robert L. Scranton (d. 1993). *Professor of Classical Art and Archaeology, University of Chicago, 1961–77.*

Howard Hayes Scullard (d. 1983). *Professor of Ancient History, King's College, University of London, 1959–70.*

B. Raphael Sealey. *Professor of History, University of California, Berkeley.*

Jakob Seibert. *Professor of Ancient History, Ludwig Maximilian University of Munich.*

M.V. Seton-Williams (d. 1992). *Honorary Research Fellow in Egyptian and Coptic, University College, University of London, 1971–79. Director of archaeological expeditions in Turkey, Syria, Jordan, Egypt, and Cyprus.*

Charles Seymour (d. 1963). *President, Yale University, 1937–50; Professor of History, 1918–37.*

Irfan Arif Shahîd. *Professor of Arabic, Georgetown University, Washington, D.C.*

David Allen Shannon (d. 1991). *Commonwealth Professor of History, University of Virginia, Charlottesville; Vice President and Provost, 1971–81.*

The Rev. R. Norman Sharp (d. 1995). *Assistant Professor of Old Persian and Pahlavi, Pahlavi University, Shîrâz, Iran, 1962–67.*

Ivan Peter Shaw. *Former Fellow and Secretary, King's College, University of London. Author of Nationality and the Western Church Before the Reformation.*

Hugh Shearman. *Historian and writer on politics and world affairs. Author of Modern Ireland; Ulster; and others.*

Eric William Sheppard. *Major, British Army (retired). Author of A Short History of the British Army and others.*

George Albert Shepperson. *William Robertson Professor Emeritus of Commonwealth and American History, University of Edinburgh.*

Adrian N. Sherwin-White (d. 1993). *Reader in Ancient History, University of Oxford, 1966–79.*

James Henry Shideler. *Professor of History, University of California, Davis.*

Minoru Shinoda. *Emeritus Professor of History, University of Hawaii at Manoa, Honolulu.*

David C.G. Sibley. *Freelance writer and artist.*

Winant Sidle. *Brigadier General, U.S. Army.*

Julie Siegel. *Freelance writer.*

Henry Harrison Simms. *Emeritus Professor of History, Ohio State University, Columbus.*

John Y. Simon. *Professor of History, Southern Illinois University, Carbondale. Executive Director, Ulysses S. Grant Association.*

Eric Norman Simons (d. 1983). *Author of The Queen and the Rebel: Mary Tudor and Wyatt the Younger and others.*

John M. Simpson. *Senior Lecturer in Scottish History, University of Edinburgh.*

Roger Henry Simpson. *Historian and lecturer.*

Andrew Annandale Sinclair. *Historian and filmmaker. Author of Guevara and others.*

Otis Arnold Singletary. *President, University of Kentucky, Lexington.*

N.K. Sinha (d. 1974). *Professor and Head, Department of History, University of Calcutta, 1955–68.*

Stephan Skalweit. *Emeritus Professor of Modern History, Rhenish Friedrich Wilhelm University of Bonn.*

Fridlev Skrubbeltrang. *Lecturer in Agricultural History, University of Copenhagen, 1956–71.*

Bradford Smith (d. 1964). *Author of Bradford of Plymouth; Captain John Smith; and others.*

Lacey Baldwin Smith. *Peter B. Ritzma Professor Emeritus of Humanities, Northwestern University, Evanston, Ill.*

Robert Ross Smith. *Chief, General History Branch, U.S. Army Center of Military History, Washington, D.C.*

Thomas C. Smith. *Ford Professor of History and Comparative Studies, University of California, Berkeley.*

Kazimierz Maciej Smogorzewski (d. 1992). *London Correspondent, Kurier Polski (Warsaw), 1957–81. Founder and Editor, Free Europe, 1939–45. Foreign correspondent, 1919–39.*

Albert M. Soboul (d. 1982). *Professor of the History of the French Revolution, University of Paris I.*

Ramón Solis Llorente (d. 1978). *Novelist and historian. Corresponding member, Royal Academy of History, Madrid.*

Albert Somit. *President, Southern Illinois University, Carbondale.*

Dominique Sourdel. *Professor of Muslim Civilization, University of Paris IV.*

Donald Southgate. *Former Reader in Political and Constitutional History, University of Dundee, Scot.*

T.G. Percival Spear (d. 1982). *Fellow of Selwyn College, Cambridge; Lecturer in History, University of Cambridge, 1963–69.*

Arnold Spekke (d. 1972). *Author of History of Latvia and others.*

David Spring. *Professor of History, Johns Hopkins University, Baltimore.*

Chester G. Starr. *Bentley Professor Emeritus of Ancient History, University of Michigan, Ann Arbor.*

Alfred Steinberg (d. 1995). *Writer and historian. Author of Man from Missouri: The Life and Times of Harry S. Truman and others.*

S. Henry Steinberg (d. 1969). *Editor, The Statesman's Year-Book, 1946–69.*

Doris Mary Stenton (d. 1971). *Reader in History, University of Reading, Eng.*

Ruth Stephan (d. 1974). *Writer. Author of My Crown, My Love and others.*

George R. Stewart (d. 1980). *Professor of English, University of California, Berkeley, 1942–62.*

Arndt Mathis Stickles (deceased). *Professor of History, Western Kentucky University, Bowling Green.*

Hudson Strode (d. 1976). *Professor of English, University of Alabama, Tuscaloosa, 1924–63.*

David Brian Stronach. *Professor of Near Eastern Studies, University of California, Berkeley.*

Hans Sturmberger. *Former Director, Upper Austrian Provincial Archives, Linz.*

Leo Suryadinata. *Former Research Associate, Centre for Southeast Asian Studies, Kyôto University, Japan.*

N.M. Sutherland. *Emeritus Professor of Early Modern History, Royal Holloway and Bedford New College, University of London.*

Harald Ulrik Sverdrup (d. 1957). *Director, Norwegian Polar Research Institute, Oslo, 1948–57. Director, Scripps Institution of Oceanography, University of California, San Diego, at La Jolla, 1936–48.*

Victor-Lucien Tapié (d. 1974). *Member, Academy of Moral and Political Sciences, Institute of France, Paris, 1963–74. Professor of Modern History, University of Paris IV, 1949–70.*

John Taylor. *Reader in Medieval History, University of Leeds, Eng.*

Robert H. Taylor. *Lecturer in Political Studies, School of Oriental and African Studies, University of London.*

Geoffrey Templeman (d. 1988). *Vice-Chancellor, University of Kent at Canterbury, Eng., 1963–80.*

Henri-Louis-Étienne Terasse (d. 1971). *Curator, Historic Monuments of Morocco, 1935–57. Director, Institute for Advanced Moroccan Studies, Rabat, Mor., 1941–57. Chairman, Department of Islāmic Archaeology, University of Algiers, 1945–57. Director, Casa de Velázquez, Ciudad University, Madrid, 1957–65.*

Romila Thapar. *Emeritus Professor of History, Jawaharlal Nehru University, New Delhi.*

David P. Thelen. *Professor of History, Indiana University, Bloomington.*

Alfred Barnaby Thomas. *Emeritus Professor of History, University of Alabama, Tuscaloosa.*

John L. Thomas. *Professor of History, Brown University, Providence, R.I.*

Nicholas de L'Eglise Wolferstan Thomas. *Former Keeper, Department of Archaeology, City Museum, Birmingham, Eng.*

Arthur Frederick Thompson. *Fellow and Tutor of Wadham College, Oxford; Lecturer in Modern History, University of Oxford.*

E.A. Thompson (d. 1994). *Professor of Classics, University of Nottingham, Eng., 1948–79.*

Lewis Thorpe (d. 1977). *Professor of French, University of Nottingham, Eng., 1958–77.*

Roy Gilbert Thurburn. *Brigadier, the Cameronians (Scottish Rifles) (retired). Secretary, Army Museums Ogilby Trust, Ministry of Defence, London, 1957–72.*

Frederick B. Tolles (d. 1975). *Howard M. Jenkins Professor of Quaker History and Research, 1954–70; Director, Friends Historical Library, Swarthmore College, Pa., 1941–70.*

Conrad D. Totman. *Professor of History, Yale University.*

Hans Louis Trefousse. *Professor of History, Brooklyn College, City University of New York.*

Reginald Francis Treharne (d. 1967). *Professor of History, University College of Wales, Aberystwyth, University of Wales, 1930–67.*

Piero Treves (d. 1992). *Professor of Ancient History, University of Venice.*

Glenn Tucker (d. 1976). *Freelance writer and historian. Author of Tecumseh: Vision of Glory and others.*

Sir Eric Gardner Turner (d. 1983). *Professor of Papyrology, University College, University of London, 1950–78; Director, Institute of Classical Studies, 1953–63.*

Edward Ullendorff. *Emeritus Professor of Semitic Languages, School of Oriental and African Studies, University of London.*

Esta Ungar. *Research Fellow in Far Eastern History, Research School of Pacific Studies, Australian National University, Canberra.*

Ernesto Valgiglio (d. 1990). *Professor of Greek and Latin Grammar, University of Genoa.*

Glyndon G. Van Deusen (deceased). *Professor of History, University of Rochester, N.Y., 1947–62.*

Frank Everson Vandiver. *Emeritus President, Texas A&M University, College Station.*

Richard Vaughan. *Former Professor of History, University of Hull, Eng.*

J. Charles Verlinden. *Emeritus Professor of History, State University of Ghent, Belg.*

Jean Vidalenc. *Former Professor of Contemporary History, University of Rouen, Fr.*

Alan John Villiers (d. 1982). *Freelance writer. President, Society for Nautical Research, London. Author of Captain James Cook and many others.*

Marcelle Vioux (deceased). *Freelance writer. Author of François I; Henri IV; and others.*

Hans Volkmann (deceased). *Professor of Ancient History, University of Cologne.*

The Rev. Edward Robert Vollmar, S.J. (d. 1976). *Professor of History and Associate Director of Libraries, St. Louis University, Mo.*

John Waechter. *Former Senior Lecturer in Paleolithic Archaeology, Institute of Archaeology, University of London.*

Peter Busby Waite. *Professor of History, Dalhousie University, Halifax, N.S.*

Frank W. Walbank. *Rathbone Professor Emeritus of Ancient History and Classical Archaeology, University of Liverpool.*

Paul E. Walker. *Former Associate Professor of Islamic Studies, McGill University, Montreal.*

William Stewart Wallace (d. 1970). *Librarian, University of Toronto. Author of A History of the Canadian People.*

John Michael Wallace-Hadrill (d. 1985). *Chichele Professor of Modern History, University of Oxford, 1974–83; Fellow of All Souls College, Oxford.*

Immanuel Wallerstein. *Distinguished Professor of Sociology, State University of New York at Binghamton.*

Friedrich Walter (d. 1968). *Extraordinary Professor of Modern Austrian History, University of Vienna, 1955–67.*

Yi Chu Wang. *Emeritus Professor of History, Queens College, City University of New York.*

William Reginald Ward. *Professor of Modern History, University of Durham, Eng.*

John Bryair Ward-Perkins (d. 1981). *Director, British School at Rome, 1946–74.*

Brian H. Warmington. *Former Reader in Ancient History, University of Bristol, Eng.*

Oliver Martin Wilson Warner (d. 1976). *Naval historian. Member, Council of the Society of Nautical Research, 1955–60; Council of the Navy Records Society, 1969–70.*

John Steven Watson (d. 1986). *Principal and Vice-Chancellor, University of St. Andrews, Scot., 1966–86.*

William Watson. *Emeritus Professor of Chinese Art and Archaeology; Head, Percival David Foundation of Chinese Art, 1966–83, School of Oriental and African Studies, University of London.*

Bruce Webster. *Former Senior Lecturer in History, University of Kent at Canterbury, Eng.*

Dame C.V. Wedgwood (d. 1997). *Freelance writer and historian. Fellow, University College, University of London, 1965–97.*

Saul S. Weinberg (d. 1992). *Professor of Classical Archaeology, University of Missouri, Columbia, 1960–74.*

Lynn Weiner. *Freelance writer.*

Edward Weintal (d. 1973). *Diplomatic Correspondent, Chief European Correspondent, and Contributing Editor, Newsweek magazine, 1944–69.*

C. Bradford Welles (d. 1969). *Professor of Ancient History, Yale University, 1940–69.*

Manly Wade Wellman (d. 1986). *Novelist and writer on American history. Author of Giant in Gray: A Biography of Wade Hampton of South Carolina and others.*

Edward F. Wente. *Professor of Egyptology, Oriental Institute and Department of Near Eastern Languages and Civilizations, University of Chicago.*

Robert Werner. *Emeritus Professor of Ancient History, Friedrich Alexander University of Erlangen-Nuremberg, Ger.*

Richard Bruce Wernham. *Emeritus Professor of Modern History, University of Oxford; Fellow of Worcester College, Oxford, 1951–72.*

H. van Werveke (d. 1974). *Professor of the History of Belgium, State University of Ghent.*

William C. West. *Consultant on Russian literature and Soviet affairs.*

Gunnar Torvald Westin. *Emeritus Professor of History, University of Stockholm.*

Vera Muriel White. *Former Extramural Lecturer, University of Cambridge.*

Matthew Immanuel Wiencke. *Emeritus Professor of Classics, Dartmouth College, Hanover, N.H.*

Hermann Wiesflecker. *Professor of Austrian History, University of Graz, Austria.*

Donald N. Wilber. *Freelance writer and consultant on the Middle East and Southeast Asia. Author of Iran Past and Present and others.*

Charles Henry Wilson (d. 1991). *Professor of Modern History, University of Cambridge, 1965–79; Fellow of Jesus College, Cambridge, 1938–91.*

John A. Wilson (d. 1976). *Andrew MacLeish Distinguished Service Professor of Egyptology, University of Chicago, 1953–68.*

Oscar O. Winther (d. 1970). *University Professor of History, Indiana University, Bloomington, 1965–70.*

Donald John Wiseman. *Emeritus Professor of Assyriology, School of Oriental and African Studies, University of London.*

Elizabeth Wiskemann (d. 1971). *Montague Burton Professor of International Relations, University of Edinburgh, 1958–61. Tutor in Modern History, University of Sussex, Eng., 1961–64.*

Gunther Wolf. *Former Professor of History, University of Stuttgart, Ger.*

James Madison Wood, Jr. *Professor of History, Santa Monica College, Calif.*

Sir Leonard Woolley (d. 1960). *Archaeologist; excavated at Ur, 1922–34, and many other sites. Author of Digging Up the Past and others.*

Brian Harvey Goodwin Wormald. *Emeritus Fellow of Peterhouse, Cambridge; Lecturer in History, University of Cambridge, 1948–79.*

Edmund H. Worthy, Jr. *Associate Director, The Smithsonian Associate, Smithsonian Institution, Washington, D.C.*

Arthur F. Wright (d. 1976). *Charles Seymour Professor of History, Yale University, 1961–76.*

Gordon Wright. *William H. Bonsall Professor Emeritus of History, Stanford University, Calif.*

David K. Wyatt. *Professor of History, Cornell University, Ithaca, N.Y.*

Malcolm Edward Yapp. *Emeritus Professor of the Modern History of Western Asia, School of Oriental and African Studies, University of London.*

John Howard Young (d. 1978). *W.H. Collins Vickers Foundation Professor of Archaeology, Johns Hopkins University, Baltimore, 1956–78.*

Mary Elizabeth Young. *Professor of History, University of Rochester, N.Y.*

T(heodore) Cuyler Young (d. 1976). *Horatio Whitridge Garrett Professor of Persian Language and History, 1952–69; Chairman, Oriental Studies Department, Princeton University, 1954–69.*

Andrzej Zahorski. *Professor of Modern History, University of Warsaw.*

Ernst Walter Zeeden. *Emeritus Professor of Modern and Medieval History, Eberhard Karl University of Tübingen, Ger.*

Herbert Zeiden. *Freelance writer in the area of history.*

Nicola Abdo Ziadeh. *Emeritus Professor of Arab History, American University of Beirut.*

E. Zudaire Huarte (deceased). *Instructor, Good Counsel Academy, Lecaroz, Spain. Author of El conde-duque y Cataluña and others.*

Part Ten. The Branches of Knowledge

Harry Burrows Acton (d. 1974). *Professor of Moral Philosophy, University of Edinburgh, 1964–74.*

Alexander Altmann (d. 1987). *Philip W. Lown Professor of Jewish Philosophy, Brandeis University, Waltham, Mass., 1959–76.*

Mikhail S. Arlazorov. *Former staff member, Union of Cinematographers, Moscow.*

A. Hilary Armstrong. *Gladstone Professor Emeritus of Greek, University of Liverpool.*

Richard Paul Aulie. *Historian of science. Lecturer in Natural Science, Loyola University, Chicago, 1972–76. Associate Editor, Encyclopædia Britannica, Chicago, 1971–72.*

Edward J. Barbeau. *Professor of Mathematics, University of Toronto.*

George Alfred Barnard. *Emeritus Professor of Mathematics, University of Essex, Eng.*

Glen W. Baxter. *Senior Lecturer on East Asian Studies, Harvard University, 1956–80; Associate Director, Harvard-Yenching Institute, 1964–80.*

Geoffrey H. Beale. *Royal Society Research Professor of Genetics, University of Edinburgh, 1963–78.*

Yvon Belaval (d. 1988). *Professor of Philosophy, University of Paris I, 1965–79.*

Eric Temple Bell (d. 1960). *Professor of Mathematics, California Institute of Technology, Pasadena, 1926–60.*

Leonard D. Berkovitz. *Professor of Mathematics, Purdue University, West Lafayette, Ind.*

Simeon Berman. *Professor of Mathematics, Courant Institute of Mathematical Sciences, New York University, New York City.*

Michael V. Berry. *Royal Society Research Professor of Physics, University of Bristol, Eng.*

Cyril Bibby. *Principal, Kingston upon Hull College of Education, University of Hull Institute of Education, Eng., 1959–76.*

Peter G. Bietenholz. *Professor of History, University of Saskatchewan, Saskatoon.*

Otto Allen Bird. *Emeritus Professor of Arts and Letters, University of Notre Dame, Ind.*

Haig Bohigian. *Professor of Mathematics and Operations Research, John Jay College of Criminal Justice, City University of New York.*

Otto Friedrich Bollnow. *Emeritus Professor of Philosophy and Education, Eberhard Karl University of Tübingen, Ger.*

Carl B. Boyer (d. 1976). *Professor of Mathematics, Brooklyn College, City University of New York, 1952–76.*

Felix E. Browder. *Vice President for Research; Professor of Mathematics, Rutgers University, New Brunswick, N.J.*

Delwin Brown. *Harvey H. Potthoff Professor of Christian Theology, Iliff School of Theology, Denver, Colo.*

David L. Buckley. *Freelance writer on philosophy and music.*

Ulick Peter Burke. *Professor of Cultural History, University of Cambridge; Fellow of Emmanuel College, Cambridge.*

Martin D. Burrow. *Emeritus Professor of Mathematics, Courant Institute of Mathematical Sciences, New York University, New York City.*

Lyman H. Butterfield (d. 1982). *Editor in Chief, The Adams Papers, Massachusetts Historical Society, Boston, 1954–75.*

Robert W. Cahn. *Former Professor of Materials Science, University of Sussex, Brighton, Eng.*

Seymour Cain. *Fellow, National Endowment for the Humanities, Washington, D.C., 1979–80. Senior Editor, Religion, Encyclopædia Britannica, Chicago, 1967–73.*

A. Robert Caponigri (d. 1983). *Professor of Philosophy, University of Notre Dame, Ind.*

Frederick F. Cartwright. *Emeritus Senior Lecturer in the History of Medicine, King's College Hospital, University of London.*

George Law Cawkwell. *Former Lecturer in Ancient History, University of Oxford; Emeritus Fellow of University College, Oxford.*

Jules-Marie Chaix-Ruy. *Professor of Philosophy, University of Nice, Fr., 1965–67.*

Donald Geoffrey Charlton. *Emeritus Professor of French, University of Warwick, Coventry, Eng.*

Chung-hwan Chen. *Emeritus Professor of Philosophy, University of South Florida, Tampa.*

Alonzo Church (d. 1995). *Professor of Mathematics and Philosophy, University of California, Los Angeles, 1967–90.*

Martin Lowther Clarke. *Former Professor of Latin, University College of North Wales, Bangor, University of Wales.*

Gerald M. Clemence (d. 1974). *Professor of Astronomy, Yale University, 1966–74.*

I. Bernard Cohen. *Victor S. Thomas Professor Emeritus of the History of Science, Harvard University.*

Frederick Coppotelli. *Freelance writer on mathematics.*

H.S. MacDonald Coxeter. *Emeritus Professor of Mathematics, University of Toronto.*

Rupert Crawshay-Williams (d. 1977). *Author of Russell Remembered; Methods and Criteria of Reasoning; and others.*

The Rev. Theodore Crowley, O.F.M. (d. 1990). *Professor of Scholastic Philosophy, Queen's University of Belfast, N.Ire.*

J.G. Crowther (d. 1983). *Author of Famous American Men of Science; Science in Modern Society; and others.*

Glyn Edmund Daniel (d. 1986). *Disney Professor of Archaeology, University of Cambridge, 1974–81; Fellow of St. John's College, Cambridge.*

Joseph Dauben. *Professor of the History of Science, Herbert H. Lehman College, City University of New York, Bronx.*

Charles De Prima. *Emeritus Professor of Mathematics, California Institute of Technology, Pasadena.*

Carlo Diano (d. 1974). *Professor of Greek Literature, University of Padua, Italy.*

Bern Dibner (d. 1988). *Historian of science and technology. Founder and Director, Burndy Library, Norwalk, Conn., 1935–88.*

Paul Dibon (d. 1995). *Director, École Pratique des Hautes Études, Paris.*

A. Vibert Douglas (d. 1988). *Professor of Astronomy, Queen's University at Kingston, Ont., 1943–63.*

Seymour Drescher. *University Professor of History, University of Pittsburgh.*

Michael A.E. Dummett. *Wykeham Professor Emeritus of Logic, University of Oxford; Emeritus Fellow of New College and of All Souls College, Oxford.*

James H. Earle. *Professor of Civil Engineering, Texas A&M University, College Station.*

William R. Eckhardt. *Freelance writer on mathematics.*

Dorothy Mary Emmet. *Emeritus Professor of Philosophy, Victoria University of Manchester.*

Robert A. Fefferman. *Professor of Mathematics, University of Chicago.*

Louis H. Feldman. *Professor of Classics, Yeshiva University, New York City.*

Raphael Finkel. *Professor of Computer Science, University of Kentucky, Lexington.*

Sir Raymond William Firth. *Emeritus Professor of Anthropology, University of London.*

Ronald Fletcher (d. 1992). *Professor of Sociology, University of Reading, Eng., 1979–82.*

Marcel Florkin, M.D. (d. 1979). *Professor of Biochemistry, State University of Liège, Belg.*

Frieda Fordham (deceased). *Training analyst, Society of Analytical Psychology, London.*

Michael S.M. Fordham (d. 1995). *Analytical psychologist. Coeditor of The Collected Works of C.G. Jung.*

Sidney W. Fox. *Distinguished Research Scientist, Department of Marine Sciences, University of South Alabama, Mobile. Research Professor and Director, Institute for Molecular and Cellular Evolution, University of Miami, Coral Gables, Fla., 1964–89.*

Manfred S. Frings. *Emeritus Professor of Philosophy, DePaul University, Chicago. Director, The Max Scheler Archives, Albuquerque, N.M., and Munich, Ger.*

Andrew M. Gallant. *Freelance writer on mathematics.*

W. Horsley Gantt, M.D. (d. 1980). *Associate Professor of Psychiatry, 1932–58; Director, Pavlovian Laboratory, School of Medicine, Johns Hopkins University, Baltimore.*

Elizabeth Belmont Gasking (d. 1973). *Senior Lecturer in the History and Philosophy of Science, University of Melbourne, Australia.*

Frances Carney Gies. *Coauthor of Leonard of Pisa and the New Mathematics of the Middle Ages and others.*

Boris Vladimirovich Gnedenko. *Former Professor of Physics and Mathematics, Moscow M.V. Lomonosov State University.*

Kenneth P. Goldberg. *Professor of Mathematics Education, New York University, New York City.*

Arnold Wycombe Gomme (d. 1959). *Professor of Greek, University of Glasgow, 1946–57.*

Samuel L. Greitzer. *Emeritus Professor of Mathematics, Rutgers University, New Brunswick, N.J.*

Ronald Grimsley. *Emeritus Professor of French, University of Bristol, Eng.*

William Keith Chambers Guthrie (d. 1981). *Laurence Professor of Ancient Philosophy, University of Cambridge, 1952–73; Master of Downing College, Cambridge, 1957–72.*

John G. Hargrave (d. 1982). *Author of The Life and Soul of Paracelsus and others.*

Melvin Hausner. *Professor of Mathematics, Washington Square College, New York University, New York City.*

Carl G. Hempel. *Stuart Professor Emeritus of Philosophy, Princeton University. University Professor of Philosophy, University of Pittsburgh, Pa.*

Norman V. Henfrey. *Lecturer in English, University of Bristol, Eng.*

Eckhard H. Hess (d. 1986). *Professor of Psychology, University of Chicago, 1959–86.*

Roland John Hill. *Former London Correspondent, Die Presse (Vienna) and Stuttgarter Zeitung, Stuttgart, W.Ger.*

Peter John Hilton. *Distinguished Professor Emeritus of Mathematics, State University of New York at Binghamton.*

Harry Hochstadt. *Professor and Head, Department of Mathematics, Polytechnic Institute of New York, Brooklyn.*

Banesh Hoffman (d. 1986). *Professor of Mathematics, Queen's College, City University of New York, Flushing.*

Dewey J. Hoitenga, Jr. *Professor of Philosophy, Calvin College, Grand Rapids, Mich.*

Constantin Ludwig Adolph Rudolph Hope. *Vicar, St. Michael's and All Angels, New Marston, Oxford, Eng.*

Michael Anthony Hoskin. *Fellow of Churchill College, Cambridge; former Lecturer in the History of Science, University of Cambridge.*

Kung-chuan Hsiao (d. 1981). *Professor of the History of Chinese Thought, University of Washington, Seattle, 1959–68.*

Arthur Hübscher. *Former Director, Schopenhauer Archives, Frankfurt. Senior President, International Schopenhauer Society, Frankfurt.*

Aaron J. Ihde. *Emeritus Professor of Chemistry and History of Science, University of Wisconsin, Madison.*

Yasuke Ikari. *Instructor, Seminar for Indology, Kyōto University.*

Charles Issawi. *Bayard Dodge Professor Emeritus of Near Eastern Studies, Princeton University.*

Bernard Jaffe (d. 1986). *Freelance science writer. Chairman, Science Department, James Madison High School, Brooklyn, New York, 1944–58.*

A. Walter James. *Principal, St. Catharine's, Windsor, England, 1974–82. Editor, The Times (London) Educational Supplement, 1952–69.*

Horace M. Kallen (d. 1974). *Professor of Social Philosophy, New School for Social Research, New York City, 1919–52.*

Irving Kaplansky. *Director Emeritus, Mathematical Sciences Research Institute, Berkeley, Calif. George Herbert Mead Distinguished Service Professor Emeritus of Mathematics, University of Chicago.*

Charlotte L. Kellner. *Former Lecturer in Physics, Imperial College of Science and Technology, University of London.*

Joan Kelly-Gadol (d. 1982). *Professor of History, City College, City University of New York, 1972–82.*

Jim Kenevan. *Freelance writer on mathematics.*

Lester S. King, M.D. *Former Professorial Lecturer in the History of Medicine, University of Chicago.*

Stephen Cole Kleene (d. 1994). *Dean of Letters and Science, 1969–74; Cyrus C. MacDuffee Professor of Mathematics and Computer Science, University of Wisconsin, Madison, 1974–79.*

David Marcus Knight. *Professor of History and Philosophy of Science, University of Durham, Eng.*

Sir T. Malcolm Knox (d. 1980). *Principal, University of St. Andrews, Scot., 1953–66; Professor of Moral Philosophy, 1936–53.*

Richard Kroner (d. 1974). *Professor of the Philosophy of Religion, Union Theological Seminary, New York City, 1941–55.*

Ludwig M. Landgrebe (deceased). *Professor of Philosophy, University of Cologne. Director of the Husserl Archives, Cologne.*

Anneli Lax. *Professor of Mathematics, Washington Square and University College of Arts and Science, New York University, New York City.*

Robert Lekachman (d. 1989). *Distinguished Professor of Economics, Herbert H. Lehman College, City University of New York, 1973–89.*

Casimir Lewy (d. 1991). *Fellow of Trinity College, Cambridge, 1959–91; Reader in Philosophy, University of Cambridge, 1972–82.*

R. Bruce Lindsay (d. 1985). *Hazard Professor of Physics, Brown University, Providence, R.I., 1936–71.*

Antony Charles Lloyd. *Professor of Philosophy, University of Liverpool.*

David Morrice Low (d. 1972). *Classical Lecturer and Subdean, Arts Faculty, King's College, University of London, 1945–57.*

Victor Lowe (d. 1988). *Professor of Philosophy, Johns Hopkins University, Baltimore, 1961–73.*

David Edward Luscombe. *Professor of Medieval History, University of Sheffield, Eng.*

John David Mabbott (d. 1988). *President, St. John's College, University of Oxford, 1963–69. Author of An Introduction to Ethics and others.*

Donald Gunn MacRae. *Martin White Professor Emeritus of Sociology, London School of Economics and Political Science, University of London.*

Norman A. Malcolm (d. 1990). *Susan Linn Sage Professor of Philosophy, Cornell University, Ithaca, N.Y., 1964–78.*

Frank J. Malina (d. 1981). *Trustee, International Academy of Astronautics, Paris, 1963–81; President, 1963. Founder-Editor, Leonardo (international journal of the contemporary artist).*

Kishore B. Marathe. *Associate Professor of Mathematics, Brooklyn College, City University of New York.*

Herbert S. Matsen. *Associate Professor of Philosophy, University of South Carolina, Columbia, 1972–82.*

Yi Pao Mei. *Henry Luce Professor of Humanities, Tunghai University, T'ai-chung, Taiwan, 1973–77. Professor of Oriental Studies, University of Iowa, Iowa City, 1955–70.*

Philip Merlan (d. 1968). *Professor of German Philosophy and Literature, Scripps College, Claremont, Calif., 1942–68.*

Lorenzo Minio-Paluello (d. 1986). *Reader in Mediaeval Philosophy, University of Oxford, 1956–75. Director of Aristoteles Latinus, 1959–72.*

Arthur Mitzman. *Professor of History, University of Amsterdam.*

M.L. Modica. *Freelance writer on mathematics.*

Arne D. Naess. *Emeritus Professor of Philosophy, University of Oslo.*

Hajime Nakamura. *Director, Eastern Institute, Inc., Tokyo. Emeritus Professor of Indian and Buddhist Philosophy, University of Tokyo.*

Otto E. Neugebauer. *Emeritus Professor of the History of Mathematics, Brown University, Providence, R.I.*

Robert Maxwell Ogilvie (d. 1981). *Professor of Humanity, University of St. Andrews, Scot.*

Oystein Ore (d. 1968). *Sterling Professor of Mathematics, Yale University, 1931–68.*

James Joseph O'Toole. *Vice President, Aspen Institute. University Associates' Professor of Management and Organization, University of Southern California, Los Angeles, 1982–93.*

George A. Pettitt (d. 1976). *Assistant to the President, University of California, Berkeley, 1936–66; Lecturer in Anthropology, 1940–66.*

Henri M. Peyre (d. 1988). *Distinguished Professor of French, Graduate Center, City University of New York, 1969–81. Sterling Professor of French, Yale University, 1938–69.*

Jean Piveteau (d. 1991). *Professor of Palaeontology, University of Paris, 1938–70.*

John P. Plamenatz (d. 1975). *Chichele Professor of Social and Political Theory, University of Oxford, 1967–75; Fellow of All Souls College, Oxford.*

Carl Pomerance. *Research Professor of Mathematics, University of Georgia, Athens.*

Gray Johnson Poole. *Freelance writer. Coauthor of Men Who Dig Up History and others.*

Murray Protter. *Professor of Mathematics, University of California, Berkeley.*

The Rt. Rev. Ian Thomas Ramsey (d. 1972). *Lord Bishop of Durham, Eng., 1966–72. Nolloth Professor of the Philosophy of the Christian Religion, University of Oxford, 1951–66.*

D.D. Raphael. *Emeritus Professor of Philosophy, Imperial College of Science and Technology, University of London.*

The Rev. Charles Earle Raven (d. 1964). *Regius Professor of Divinity, University of Cambridge, 1932–50. Canon of Liverpool, 1924–32.*

Roberto Ridolfi. *Member of Accademia Nazionale dei Lincei. Director of La Bibliofilia, 1944–82. Director of "National Editions of the Works of Savonarola."*

Philip C. Ritterbush. *Historian of science. Former Program Director, Institute for Cultural Progress, Washington, D.C.*

Alfredo Riva. *Assistant Professor of Industrial Chemistry, University of Bologna, Italy.*

Peter P. Rohde (d. 1978). *Freelance writer. Author of Søren Kierkegaard.*

Sydney Ross. *Emeritus Professor of Chemistry, Rensselaer Polytechnic Institute, Troy, N.Y.*

Joan Saberhagen. *Freelance writer on mathematics.*

Sir Edward James Salisbury (d. 1978). *Director, Royal Botanic Gardens, Kew, Eng., 1943–56.*

V.C. Samuel. *Former Dean, Theological College, University of Addis Ababa, Eth.*

Francis Henry Sandbach (d. 1991). *Fellow of Trinity College, Cambridge, 1927-91; Professor of Classics, University of Cambridge, 1967-70.*

Hans Saner. *Freelance writer. Personal assistant to Professor Karl Jaspers, 1962-69. Author of Karl Jaspers.*

Vera Sanford (deceased). *Professor of Mathematics, State University of New York College at Oneonta, 1943-59.*

Arthur Schlissel. *Professor of Mathematics, John Jay College of Criminal Justice, City University of New York.*

Walter Schulz. *Emeritus Professor of Philosophy, Eberhard Karl University of Tübingen, Ger.*

Jacob T. Schwartz. *Chairman, Department of Computer Science, Courant Institute of Mathematical Sciences, New York University, New York City.*

Joseph Frederick Scott (d. 1971). *Vice-Principal; Principal Lecturer in Mathematics, St. Mary's College, Strawberry Hill, Eng.*

Abraham Seidenberg. *Professor of Mathematics, University of California, Berkeley.*

Jean J. Seznec (d. 1983). *Marshal Foch Professor of French Literature, University of Oxford, 1950-72.*

Robert Shackleton (d. 1986). *Marshal Foch Professor of French Literature, University of Oxford, 1979-86; Bodley's Librarian, 1966-79.*

James Shiel. *Former Reader in the History of Hellenic Thought, University of Sussex, Brighton, Eng.*

Stephen Smale. *Professor of Mathematics, University of California, Berkeley.*

Gertrude Smith (d. 1985). *Professor of Greek, University of Chicago, 1933-72.*

Ian Naismith Sneddon. *Emeritus Professor of Mathematics, University of Glasgow.*

Murray R. Spiegel. *Freelance writer on mathematics.*

Martin K. Starr. *Professor of Management Science, Columbia University.*

Johannes Steudel (d. 1973). *Professor of the History of Medicine, Rhenish Friedrich Wilhelm University of Bonn.*

Lloyd Grenfell Stevenson, M.D. (deceased). *William H. Welch Professor of the History of Medicine; Director, Institute of the History of Medicine, Johns Hopkins University, Baltimore, 1968-83.*

Ian Nicholas Stewart. *Professor of Mathematics, University of Warwick, Coventry, Eng.*

Brian Vincent Street. *Senior Lecturer in Social Anthropology, University of Sussex, Brighton, Eng.*

Dirk Jan Struik. *Emeritus Professor of Mathematics, Massachusetts Institute of Technology, Cambridge.*

Patricia E. Styer. *Graduate student in statistics, University of Chicago.*

Yoshinori Takeuchi. *Emeritus Professor of Philosophy of Religion, Kyōto University.*

Tang Chun-i. *Former Professor of Philosophy, New Asia College, Chinese University of Hong Kong.*

Brian Tierney. *Bowmar Professor of Humanistic Studies, Cornell University, Ithaca, N.Y.*

Ettore Toffoletto, M.D. *President of the Administration Council, Arts Academy, Bologna, Italy.*

Alan C. Tucker. *Professor of Applied Mathematics and Statistics, State University of New York at Stony Brook.*

Walter Tuvell. *Freelance writer on mathematics.*

E. Ashworth Underwood, M.D. (d. 1980). *Director, Wellcome Institute of the History of Medicine, London, 1946-64.*

Peter Ungar. *Emeritus Professor of Mathematics, New York University, New York City.*

Arne Unhjem. *Professor of Philosophy, Wagner College, Staten Island, N.Y.*

Rudolf Vierhaus. *Professor and Director, Max Planck Institute for History, Göttingen, Ger.*

Paul D. Vignaux (d. 1987). *President, Section of Religious Sciences, École Pratique des Hautes Études (Institute for Advanced Research), Paris, 1961-72.*

Bartel Leendert van der Waerden. *Emeritus Professor of Mathematics, University of Zürich.*

William Henry Walsh (d. 1986). *Professor of Logic and Metaphysics, University of Edinburgh, 1960-79.*

Yi-T'ung Wang. *Professor of Classical Chinese, University of Pittsburgh.*

Harold W. Wardman. *Emeritus Professor of French Studies, University of Lancaster, Eng.*

Fritz Wehrli. *Professor of Classical Philology, University of Zürich.*

Richard S. Westfall (d. 1996). *Professor of History of Science, Indiana University, Bloomington, 1963-89.*

Gerald James Whitrow. *Emeritus Professor of the History and Applications of Mathematics, Imperial College of Science and Technology, University of London.*

Lothar F.K. Wickert (d. 1989). *Professor of Ancient History, University of Cologne.*

Dallas Willard. *Associate Professor of Philosophy, University of Southern California, Los Angeles.*

Stephen S. Willoughby. *Professor and Chairman, Department of Mathematics Education, New York University, New York City.*

Paul August Wilpert (d. 1967). *Professor of Philosophy and Director of the Thomas Institute, University of Cologne.*

Lien-sheng Yang (d. 1990). *Harvard-Yenching Professor of Chinese History, Harvard University, 1965-80.*

Theodore F. Zelman. *Freelance writer on mathematics.*

Moses Zucker (d. 1987). *Professor of Biblical Exegesis, Jewish Theological Seminary of America, New York City.*

Geography

Jan Achterstraat. *Former Director, Sociografisch Bureau, Haarlemmermeer, Neth.*

Evelyn Martha Acomb-Walker. *Emeritus Professor of History, State University of New York College at New Paltz.*

Ebenezer Acquaaah-Harrison. *Former Managing Director and Chairman, Obonoma Press, Ghana.*

André Adam. *Emeritus Professor of Muslim Sociology, University of Paris V.*

Elizabeth S. Adams. *Member, Michigan Historical Commission.*

Frederick Wayne Adrian. *Emeritus Professor of History, University of Nebraska at Omaha.*

Mikhail Mikhaylovich Adrov. *Former Chief Manager, Laboratory of Oceanology, Polar Research Institute of Marine Fisheries and Oceanography, Murmansk, Russia.*

Dwight Luther Agnew. *Emeritus Professor of History; Emeritus Dean, School of Liberal Studies, University of Wisconsin-Stout, Menomonie.*

Enayat Ahmad. *Former Professor and Head, Department of Geography; former Dean, Faculty of Arts, University of Ranchi, India.*

Kazi Saied-Uddin Ahmad (d. 1970). *Professor of Geography, University of the Punjab, Lahore, Pak.*

Syed Ahmed (deceased). *Reader and Head of the Department of Geography, Osmania University, Hyderabad, India.*

Frank Oswald Ahnert. *Professor of Physical Geography, Rhenish-Westphalian Technical University, Aachen, Ger. Professor of Geography, University of Maryland, College Park, 1966-74.*

Henrik S. Ahnlund. *Director, Archaeological Museum and Historical Museum, Göteborg, Swed.*

Ayinipalli Aiyappan. *Former Special Officer, Tribal Research and Training Centre, Chevayur, India.*

Hyacinth Iheanyichuku Ajaegbu. *Professor of Geography, University of Jos, Nigeria.*

Robert Edwin Albright (d. 1969). *Professor of Social Studies, State University of New York College at Buffalo.*

William Thomas Alderson. *President, Old Salem Inc., Winston-Salem, N.C.*

Natalia Vitalyevna Aleksandrovskaya. *Former Associate Professor of Geography, Moscow M.V. Lomonosov State University.*

Lewis M. Alexander. *Emeritus Professor of Geography, University of Rhode Island, Kingston.*

John B. Allcock. *Head, Research Unit in South East European Studies, University of Bradford, Eng.*

John Edmund Allison. *Supervisor, Department of Education, University of Liverpool, 1959–64. Head, Department of Geography, Birkenhead Institute, Eng., 1921–58.*

Roland Allison. *Senior tutor, College of St. Mark and St. John, Plymouth, Eng.*

David Nelson Alloway. *Professor of Sociology, Montclair State College, N.J., 1970–82.*

Ilídio Melo Peres do Amaral. *Professor of Geography, University of Lisbon. Rector, International University, Lisbon.*

Frank Angelo. *Associate Executive Editor, Detroit Free Press, 1971–81.*

Roger M. Anthoine. *Public Information Officer, CERN (European Organization for Nuclear Research), Geneva.*

John Conrad Appel. *Emeritus Professor of History, East Stroudsburg University, Pa.*

Rosendo Arguello. *Former President, Academy of the Geography and History of Nicaragua, Managua.*

Donald Ecklund Armagost. *Former Chairman, Department of Anthropology-Sociology, State University of New York College at Potsdam.*

Terence Edward Armstrong (d. 1996). *Reader in Arctic Studies, Scott Polar Research Institute, University of Cambridge, 1977–83.*

Ethel Stephens Arnett. *Author of Greensboro, North Carolina, the County Seat of Guilford; Confederate Guns Were Stacked [at] Greensboro, North Carolina; and others.*

Nina Yakovlevna Arsenyeva. *Former Senior Member in Science, Leningrad Department, State Institute of Oceanography.*

Bruce W. Atkinson. *Professor of Geography, Queen Mary and Westfield College, University of London.*

Jack Nelson Averitt. *Professor of History; Emeritus Dean, Graduate School, Georgia Southern University, Statesboro.*

G.H.P. Aymans. *Professor of Applied Geography, Rhenish Friedrich Wilhelm University of Bonn.*

Paul Bachetta. *Former Director of Administrative Services, Office of the Mayor, Chambéry, Fr.*

E. Badian. *John Moors Cabot Professor of History, Harvard University.*

Leslie Henry Baines. *Former Clerk of the Peace and Clerk of the County Council, Isle of Wight.*

Albert Wilford Baisler. *Education Consultant, Heald Hobson & Associates, New York City. President, Jamestown Community College, N.Y., 1957–69.*

Frederick Thomas Baker. *Former Director, Lincoln Public Library, City and County Museum, and Usher Gallery, Lincoln, Eng.*

Samuel John Kenneth Baker (d. 1992). *Professor of Geography, Makerere University, Kampala, Uganda, 1949–67. Honorary Lecturer in Geography, University of Leicester, Eng., 1968–74.*

Frank Arnold Barnes. *Former Senior Lecturer in Geography, University of Nottingham, Eng.*

Lucy Goodell Barnes. *Former Research Associate, Massachusetts Institute of Technology, Cambridge.*

Norman Farley James Batchelor. *Former Public Relations Officer, London Borough of Haringey, Eng.*

Merrill D. Beal. *Emeritus Professor of History, Idaho State University, Pocatello.*

Jacqueline Beaujeu-Garnier. *Emeritus Professor of Geography, University of Paris I. President, Society of Geography, Paris.*

J. Murray Beck. *Emeritus Professor of Political Science, Dalhousie University, Halifax, N.S.*

Virginia Beck (deceased). *Professor of History, Millersville State College, Pa., 1946–70.*

Alfred M. Beeton. *Director, Great Lakes Environmental Research Laboratory, National Oceanic and Atmospheric Administration, Ann Arbor, Mich. Adjunct Professor, School of Public Health, University of Michigan, Ann Arbor.*

Natalia Maree Belting. *Former Associate Professor of History, University of Illinois at Urbana-Champaign.*

Roger William Benedict. *Managing Editor, Petroleum Intelligence Weekly, London.*

S. Ann Berich. *Former Instructor in Geography, Youngstown State University, Ohio.*

Simone Bertrand. *Former Director of the Library and of the Tapestry, Bayeux, Fr.*

Jozef Marie Nicolas Beugels. *Senior Official, Kerkrade Municipality, Neth.*

George Athan Billias. *Emeritus Professor of History, Clark University, Worcester, Mass.*

Claude T. Bissell. *Emeritus Professor of English, University of Toronto; President, 1958–71.*

Lloyd Deacon Black (d. 1989). *Professor of Geography, Northern Illinois University, De Kalb.*

Vladimir Alekseyevich Blagoobrazov (deceased). *Senior Science Editor, Soviet Encyclopaedia Publishing House, Moscow.*

Phyllis Ruth Blakeley. *Associate Archivist, Province of Nova Scotia, Halifax.*

Mary Joyce Boast. *Administration Officer of the Libraries, Southwark, London.*

Ernest Amano Boateng. *Environmental and educational consultant. Executive Chairman, Environmental Protection Council of Ghana, Accra, 1973–81.*

Hans Bobek (d. 1990). *Professor of Geography, University of Vienna.*

Eugene Reeves Bock. *Former Editor of the Editorial Page, Anderson (Ind.) Daily Bulletin.*

Norbert Bodenstedt. *Chief Director of Archives, Freising, Ger.*

Hans H. Boesch (d. 1978). *Professor of Geography, University of Zürich.*

Victor Morton Bogle. *Emeritus Chancellor; Emeritus Professor of History, Indiana University, Kokomo.*

Boris Borisovich Bogoslovsky. *Former Professor of Physical Geography of the U.S.S.R., Belorussian V.I. Lenin State University, Minsk, Belarus.*

Allan G. Bogue. *Frederick Jackson Turner Professor Emeritus of History, University of Wisconsin, Madison.*

Janis A. Bokalders (d. 1982). *Professor of Economics, University of Latvia, Riga.*

Jan Bollema. *Director, Public Relations and Information Department, Municipality of The Hague.*

Juan M. Bonelli Rubio (d. 1981). *Permanent Secretary, Royal Geographical Society, Madrid.*

Paul Yvan Bonnard. *Municipal Archivist, Aix-en-Provence, Fr.*

James Calvin Bonner. *Professor and Chairman, Department of History and Political Science, Georgia College, Milledgeville, 1944–69.*

Ernst Borchorst. *Town Clerk of Esbjerg, Den.*

Vishnu Vinayak Borkar. *Former Professor and Head, Department of Economics, Marathwada University, Aurangabad, India.*

Otto Borst. *Emeritus Professor of Regional History, University of Stuttgart, Ger.*

Clara Boscaglia. *Secretary of State for Finance and Budget, San Marino.*

G  rard Boulet. *Schoolteacher, N  mes, Fr.*

Baruch Boxer. *Professor of Geography and Environmental Sciences, Cook College, Rutgers University, New Brunswick, N.J.*

Keith Brace. *Literary Editor and Chief Feature Writer, The Birmingham Post, Eng.*

John P. van Brakel. *Municipal Works Officer and President, Historical Society, Katwijk, Neth.*

Peter Alexander Brannon (d. 1967). *Director, Alabama Department of Archives and History, Montgomery.*

Moshe Brawer. *Professor of Geography, Tel Aviv University, Israel.*

James Shober Brawley (d. 1981). *Telegraph Editor, Salisbury (N.C.) Post.*

Edward Joseph Breen. *Lawyer. Editor of History of Early Fort Dodge and Webster County, Iowa.*

John Otis Brew (d. 1988). *Peabody Professor of American Archaeology and Ethnology, Harvard University, 1949–72.*

William Charles Brice. *Emeritus Professor of Geography, Victoria University of Manchester.*

Harold Edward Briggs (deceased). *Professor of History, Southern Illinois University, Carbondale, 1945–65.*

George Mercer Brooke, Jr. *Professor of History, Virginia Military Institute, Lexington, 1958–80.*

Harold Chillingworth Brookfield. *Professor of Human Geography, Australian National University, Canberra.*

Alfred Edward Brown. *Former Director, Enfield Public Library, London Borough of Enfield, Eng.*

Chester Sidney Brown. *Former Director of Parks and Conservation, Department of Natural Resources, Government of Saskatchewan, Regina.*

Richard Holbrook Brown. *Academic Vice President, Newberry Library, Chicago.*

Robert Eugene Burke. *Emeritus Professor of History, University of Washington, Seattle. Managing Editor, Pacific Northwest Quarterly, 1966–87.*

Devereux Butcher (d. 1991). *Executive Director, National Parks and Conservation Association, 1942–50. Author of Exploring Our National Parks and Monuments and others.*

Gilbert James Butland (deceased). *Emeritus Professor of Geography, University of New England, Armidale, Australia, 1959–72; Pro-Vice-Chancellor, 1971–75.*

Robin Alan Butlin. *Professor of Geography, Loughborough University of Technology, Eng.*

Felix Buttersack. *Former Editor of M  nchner Merkur (newspaper), Munich.*

Victor Harrison Cahalane. *President, Defenders of Wildlife, 1962–71. Assistant Director, New York State Museum, Albany, 1955–67. Collaborator, National Park Service, 1955–70.*

George H. Callcott. *Professor of History, University of Maryland, College Park; Vice-Chancellor for Academic Affairs, 1970–76.*

Eila M.J. Campbell (d. 1994). *Professor of Geography, Birkbeck College, University of London.*

Erminio Canova. *Schoolmaster and journalist, Guastalla, Italy.*

Gerald M. Capers. *Emeritus Professor of History, Tulane University, New Orleans.*

Albert Sigfrid Carlson (d. 1975). *Professor of Geography, Dartmouth College, Hanover, N.H., 1944–73.*

Juan de M. Carriazo. *Professor of Ancient and Medieval Spanish History, University of Seville, 1927–69.*

Francisco Machado Carrion. *Professor of Geography, Federal University of Rio Grande do Sul, P  rto Alegre, Braz.*

Carole-Ann Carter. *Tutor in geography.*

Harvey Lewis Carter. *John and Harriet Parker Campbell Professor Emeritus of American History, Colorado College, Colorado Springs; Curator of the Archer B. Hulbert Memorial Collection of Western Americana, 1960–73.*

Jos   Candido de Melo Carvalho. *Professor, National Museum, Rio de Janeiro.*

Theodore J. Cassidy. *Former Director, Illinois State Archives, Springfield.*

John Edwards Caswell. *Emeritus Professor of History, California State College, Stanislaus, Turlock, Calif.*

Abdel Kader Chanderli (d. 1993). *Senior Adviser, the Arab Fund, Kuwait. President and General Manager, C.A.M.E.L. Petroleum Company, Algiers, 1969–75. Ambassador of Algeria to the United Nations, 1962.*

Shiba P. Chatterjee (d. 1989). *Professor of Geography, University of Calcutta.*

Jan Christensen. *Assistant Foreign Editor, Verdens Gang, Oslo.*

Charles B. Clark. *Emeritus Professor of Political Science and History, Salisbury State University, Md.*

Ira Granville Clark. *Emeritus Professor of History, New Mexico State University, Las Cruces.*

Thomas D. Clark. *Emeritus Professor of History, University of Kentucky. Distinguished Service Professor Emeritus of History, Indiana University, Bloomington.*

Frans de Clercq. *Community Official, Roosendaal en Nispen, Neth.*

Carolyn M. Clewes. *Emerita Professor of History, Wheaton College, Norton, Mass.*

Morris Harold Cohen (d. 1990). *Professor of Government, Clark University, Worcester, Mass., 1966–84.*

Saul Bernard Cohen. *University Professor of Geography, Hunter College, City University of New York, Flushing; President, Queens College, 1978–85.*

John Peter Cole. *Professor of Human and Regional Geography, University of Nottingham, Eng.*

John M. Coleman. *Emeritus Professor of History, Lafayette College, Easton, Pa.*

J(ohn) Winston Coleman, Jr. (d. 1983). *Author of Slavery Times in Kentucky; Lexington During the Civil War; and others.*

David de Lancey Condon. *Former Assistant Superintendent, Grand Canyon National Park, Arizona.*

Paul Keith Conkin. *Distinguished Professor of History, Vanderbilt University, Nashville, Tenn.*

James Robert Constantine. *Former Professor of History, Indiana State University, Terre Haute.*

Michael Garnet Cook. *University Archivist, University of Liverpool.*

John Terence Coppock. *Ogilvie Professor Emeritus of Geography, University of Edinburgh.*

Jean Coppelani. *State Town Planner, Toulouse, Fr.*

Edmund Victor Corbett. *Former Librarian, Wandsworth Public Library, London Borough of Wandsworth, Eng.*

Paul Grant Cornell. *Professor of History, University of Waterloo, Ont., 1960–85.*

William Ainsworth Cornell. *Former Assistant Executive Secretary, Pennsylvania State Education Association, Harrisburg.*

Robert Cornevin (d. 1988). *Permanent Secretary, Academy of Overseas Sciences, Paris. Head, Centre of Studies and Documentation on Africa and Overseas, Paris.*

E. Merton Coulter (d. 1981). *Professor of History, University of Georgia, Athens, 1923–58.*

John Wesley Coulter (d. 1968). *Professor of Geography, University of Cincinnati, Ohio.*

Joseph Francis Courtney. *Attorney. Former Lecturer in Public Administration, Northeastern University, Boston.*

Raymond Gibson Cowherd. *Emeritus Professor of History, Lehigh University, Bethlehem, Pa.*

James Stevens Cox. *Editor, Proceedings of the Dorset Natural History and Archaeological Society, and others.*

Clark Nixon Crain. *Former Professor of Geography and Regional Development, University of Denver, Colo.*

Albert Charles Crane. *Former Clerk, Border Rural District Council, England.*

Leland Hargrave Creer (deceased). *Professor of History, University of Utah, Salt Lake City.*

Bernarr Cresap. *Emeritus Professor of History, University of North Alabama, Florence.*

John Clark Crichton. *Professor of History, Stephens College, Columbia, Mo., 1935–70.*

Virgil Charles Crisafulli. *Emeritus Professor of Economics, Utica College of Syracuse University, N.Y.*

Gerald Roe Crone (d. 1982). *Librarian and Map Curator, Royal Geographical Society, London, 1945–66.*

Jesse Crawford Crowe. *Emeritus Professor of History, Western Kentucky University, Bowling Green.*

Kenneth Brailey Cumberland. *Former Professor of Geography, University of Auckland, New Zealand.*

Décio Neves da Cunha. *Former Professor, Center for General Education, Federal University of Espírito Santo, Vitória, Braz.*

Pedro Cunill. *Professor of Historical Geography, Central University of Venezuela, Caracas.*

Alden (Denzel) Cutshall. *Emeritus Professor of Geography, University of Illinois at Chicago.*

Ernest Rockwell Dalton (d. 1984). *Dean of Instruction, Centenary College for Women, Hackettstown, N.J.*

Arthur Davies. *Reardon-Smith Professor of Geography, University of Exeter, Eng., 1948–71.*

Wayne K.D. Davies. *Professor of Geography, University of Calgary, Alberta.*

James Treadwell Davis (deceased). *Professor of History, University of Southern Mississippi, Hattiesburg, 1953–74.*

John Armstrong Davison (d. 1966). *Professor of Greek Language and Literature, University of Leeds, Eng., 1951–66.*

Raul d'Eça. *Lecturer on Latin-American affairs. Assistant Career Planning Officer, U.S. Information Agency, 1959–61. Branch Public Affairs Officer, Recife and Belo Horizonte, Braz., Office of International Information and Cultural Affairs, 1947–58.*

John Alvin Decker. *Former Professor of Political Science, Stephens College, Columbia, Mo.*

Gerhard Deissmann. *Former Collaborator and Assistant Director, Bremen Committee for Economic Research, W.Ger.*

Henry Delmont. *Former Curator, J.B. Rames Museum, Aurillac, Fr.*

Abraham Demoz (d. 1994). *Professor of Linguistics, Northwestern University, Evanston, Ill., 1974–94; Director, Program of African Studies, 1974–80.*

René Julien C. De Roo. *Former Curator, Royal Museums of Art and History, Brussels. Archivist and Museum Director, Mechelen, Belg., 1949–63.*

Hans Otto Jerphaas de Ruyter de Wildt. *Former Chief of Educational and Cultural Affairs, Hoorn, Neth.*

P.B. Desai. *Former Professor and Head, Department of Ancient Indian History and Culture, Karnatak University, Dharwar, India.*

Jean-Jacques Despois (d. 1978). *Professor of Geography, University of Paris, 1957–69.*

Jack J. Detzler. *Professor of History, Saint Mary's College, Notre Dame, Ind.*

Caio Benjamin Dias. *Rector, University of Brasília, 1967–71.*

Samuel Newton Dicken (d. 1989). *Professor of Geography, University of Oregon, Eugene, 1947–70.*

Robert Eric Dickinson (d. 1981). *Professor of Geography, University of Arizona, Tucson, 1967–75.*

Kwamina Busumafi Dickson (d. 1992). *Vice-Chancellor, University of Cape Coast, Ghana.*

Alonzo Thomas Dill. *Public Relations Director, Chesapeake Corporation of Virginia, West Point, Va., 1958–80.*

Ernest H.G. Dobby (d. 1981). *Professor of Geography, University of Malaya, Singapore.*

William Mann Dobriner. *Emeritus Professor of Sociology, Lafayette College, Easton, Pa.*

Anatoly Petrovich Domanitsky. *Former Senior Scientist, Leningrad Hydrological Institute.*

J. Don. *Former Archivist, Kampen, Neth.*

Desmond Thomas Donovan. *Yates-Goldsmid Professor of Geology, University College, University of London, 1966–82.*

Arthur J.M. Doucy. *Professor of Social Economics; former Director, Institute of Sociology, Free University of Brussels.*

Garland Downum. *Emeritus Professor of History, Northern Arizona University, Flagstaff.*

Jean Dresch (deceased). *Professor of Geography, University of Paris VII, 1948–77.*

Robert Roland Drummond (deceased). *Professor of Geography, Indiana State University, Terre Haute.*

Raymond Dubé. *Former Editor in Chief, Le Soleil, Quebec City.*

George Harry Dury. *Emeritus Professor of Geography and Geology, University of Wisconsin, Madison.*

André Duval (deceased). *Deputy Mayor, Clichy, Fr.*

Denis John Dwyer. *Professor of Geography, University of Keele, Eng.*

Donald Ray Dyer. *Foreign Service Officer, U.S. Department of State, Washington, D.C., 1962–79.*

Wilma Dykeman. *Adjunct Professor of English, University of Tennessee, Knoxville. State Historian of Tennessee.*

David Livingstone Dykstra. *Emeritus Professor of History, Hofstra University, Hempstead, N.Y.*

Armand J. Eardley (d. 1972). *Professor of Géology, University of Utah, Salt Lake City, 1965–70; Dean, College of Mines and Mineral Industries, 1954–65.*

Herbert Leeson Edlin (d. 1976). *Publications Officer, Forestry Commission of Great Britain, London.*

Kenneth Charles Edwards (d. 1982). *Professor of Geography, University of Nottingham, Eng., 1948–70.*

Emil Egli (d. 1993). *Professor of Geography, Zürich Gymnasium. Lecturer, University of Zürich and Swiss Federal Institute of Technology, Zürich.*

Blake Ehrlich (d. 1974). *Freelance writer. Author of Paris on the Seine; London on the Thames; and many others.*

H.W. Eldermans. *Journalist. Former Editor, Rotterdamsch Nieuwsblad.*

Dorothy M. Ellicott. *Justice of the Peace. Member, City Council of Gibraltar, 1947–55; House of Assembly, 1959–64.*

Robert Neal Elliott. *Associate Professor Emeritus of History, North Carolina State University, Raleigh.*

Joseph Waldo Ellison (deceased). *Professor of History, Oregon State University, Corvallis.*

Antonia Déa Erdens. *Professor of Geography, Federal University of Bahia, Salvador, Braz.*

Sirri Erinc. *Director, Institute of Marine Sciences and Geography, University of Istanbul.*

Sir Robert Charles Evans (d. 1995). *Principal, University College of North Wales, Bangor, University of Wales, 1958–84. Author of Kangchenjunga: The Untrodden Peak and others.*

Russell Charles Ewing (d. 1972). *Professor of History, University of Arizona, Tucson, 1948–72.*

J.D. Eyles. *Former Lecturer in Geography, Queen Mary College, University of London.*

John Douglas Eyre. *Emeritus Professor of Geography, University of North Carolina at Chapel Hill.*

John D. Fage. *Emeritus Professor of African History, University of Birmingham, Eng.*

Albert Leonard Farley. *Emeritus Professor of Geography, University of British Columbia, Vancouver.*

Bertram Hughes Farmer. *Fellow of St. John's College, Cambridge; Reader in South Asian Geography, 1967–83; Director, Centre of South Asian Studies, University of Cambridge, 1964–83.*

Francis Peloubet Farquhar (d. 1975). *Author of Place Names of the High Sierra and others.*

Irmgard Feldhaus. *Former Director, Clemens Sels Museum, Neuss, Ger.*

João Epitácio Fernandes Pimenta (d. 1972). *Judge, First District of Natal, Braz., 1954–57. Member, Electoral Tribunal of Rio Grande do Norte, 1953–57.*

A.M. Ferrar. *Former Map Curator, University of Hull, Eng.*

Milton Gonçalves Ferreira. *Former Vice Rector and Director of the Faculty of Economics, Federal University of Alagoas, Maceió, Braz.*

George Leonard Fersh. *Former Associate Director, Joint Council on Economic Education, New York City.*

José Carlos de Figueiredo. *Emeritus Professor of Geography of Brazil, Federal University of Paraná, Curitiba, Braz.*

José de Silva Ribeiro Filho. *Former Professor of Criminal Law, Federal University of Sergipe, Aracaju, Braz.*

Ingo Findenegg (d. 1974). *Head, International Biological Program Laboratory, Austrian Academy of Sciences, Klagenfurt.*

George Michael Fitzpatrick. *Emeritus Editor, New Mexico Magazine.*

Betty Lorraine Fladeland. *Distinguished Professor of History, Southern Illinois University at Carbondale.*

Allen Richard Foley (d. 1978). *Professor of History, Dartmouth College, Hanover, N.H.*

Martin Otto Walter Folkerts. *Former Assistant Scientist, Institute of Geography and Economic Geography, University of Hamburg.*

Lachlan Maxwell Forbes. *Former Editor, Polar Record, Scott Polar Research Institute, University of Cambridge.*

Arthur B. Ford. *Geologist, Branch of Alaskan Geology, Geological Survey, U.S. Department of the Interior, Menlo Park, Calif.*

Enid R.A. Forde. *Former Professor of Geography, Fourah Bay College, University of Sierra Leone, Freetown.*

Charles Nelson Forward. *Professor of Geography, University of Victoria, B.C.*

Abram John Foster. *Emeritus Professor of History, Millersville University, Pa.*

Catharine Osgood Foster. *Teacher of English and American Literature, Bennington College, Vt., 1934–68.*

Lucien Fourez. *Judge, Tribunal of First Instance, Belg.*

Thomas Walter Freeman (d. 1988). *Professor of Geography, Victoria University of Manchester, 1950–76.*

Marion R. Fremont-Smith. *Attorney, Choate, Hall & Stewart, Boston. Assistant Attorney General, Commonwealth of Massachusetts, 1959–63.*

Richard Antony French. *Senior Lecturer in Geography, University College, 1972–94, and School of Slavonic and East European Studies, 1972–91, University of London.*

Hermann Friedrich. *Director, Overseas Museum, Bremen, W.Ger., 1962–70.*

Robert F. Fries. *Emeritus Professor of History, DePaul University, Chicago.*

Grigory Ivanovich Galazy. *Former Director, Institute of Limnology, Siberian Department, Academy of Sciences of the U.S.S.R., Irkutsk.*

Edward John Gallagher (d. 1978). *Publisher, Laconia (N.H.) Evening Citizen.*

Maureen L. Gallery. *Freelance writer on Middle Eastern geography.*

Hans Gamma. *Editor. Former Mayor, Altdorf, Switz.*

Vico Garbesi. *Assistant Librarian, Library of Imola, Italy.*

Elizabeth Gard. *Copy Editor, Hispanic American Historical Review, Albuquerque, N.M. Editorial Assistant, Geography, Encyclopædia Britannica, Chicago, 1970–71.*

John H. Garland. *Emeritus Professor of Geography, University of Illinois at Urbana-Champaign.*

Richard Gascon. *Former Professor of Local History, University of Lyon II.*

Werner Gatz. *Former Director, Bremen Economic Research Institute, W.Ger.*

Aleksandr Mikhaylovich Gavrilo. *Former Senior Scientist, Leningrad Hydrological Institute.*

George Roosevelt Gayler. *Emeritus Professor of History, Northwest Missouri State University, Maryville.*

Alastair George Geddes. *Former Lecturer in Adult Education, University of Southampton, Eng.*

Clyde Christian Gelbach. *Emeritus Professor of History, Indiana University of Pennsylvania.*

Susannah C. Gentry. *Former Associate Editor, Independence (Mo.) Examiner.*

Arch C. Gerlach (d. 1972). *Chief Geographer, Geological Survey, U.S. Department of the Interior, 1967–72. Incumbent, Chair of Geography, Library of Congress.*

Percy Amorey Beaufort Gethin. *Tutor in English and Political Institutions, Lennox Cook School of English, Cambridge, Eng.*

Huricihan Ghaznavi. *Former Teaching Assistant in Middle Eastern History and Turkish, University of Wisconsin, Madison.*

G.K. Ghor. *Visiting Professor of Geography, University of Benin, Nigeria.*

Arrell Morgan Gibson (d. 1987). *Professor of History, University of Oklahoma, Norman, 1957–87; Curator, Western History Collection, 1959–87.*

Frans Gijzels. *Former Mayor of Heerlen, Neth.*

Malaquias Gil Arantegui. *Emeritus Professor of History and Geography, "Pedro Henriquez Urena" National University, Santo Domingo, Dom.Rep.*

Robert Creighton Gilmore. *Emeritus Professor of History, University of New Hampshire, Durham.*

Marcel Gingras. *Secretary, Public Service Commission of Canada, Ottawa.*

Norton S. Ginsburg. *Emeritus Professor of Geography, University of Chicago.*

Francesco Giunta. *Professor of Medieval History, University of Palermo.*

Charles Nelson Glaab. *Professor of History, University of Toledo, Ohio.*

Robert Morton Glendinning (deceased). *Professor of Geography, University of California, Los Angeles.*

Stephen Goddard. *Former Deputy Librarian, School of Oriental and African Studies, University of London.*

George Goodwin, Jr. *Emeritus Professor of Political Science, University of Massachusetts, Boston.*

Arnold L. Gordon. *Professor of Oceanography, Columbia University.*

Jean Grandmaison. *Keeper of the Archives and Library, Tarascon, Fr.*

Lee Albert Graver. *Emeritus Professor of History and Political Science, Kutztown University, Pa.*

Mabel Green. *Former Lecturer in Geography, College of Education, Hull, Eng.*

Donald Paul Greene. *Former Associate Professor of History and Anthropology, Adams State College, Alamosa, Colo.*

Richard A. Greene. *Former Columnist and Editorial Writer, Muncie (Ind.) Star.*

Gwilym David Gregory. *Former Principal Assistant, London Borough of Camden Public Libraries, Eng.*

Jack Irving Grenfell. *Justice of the Peace; Town Clerk and Treasurer, City of Ararat, Australia.*

Edward Frederick Greve. *Associate Professor Emeritus of Library Science, University of Wisconsin, Superior.*

Thomas Melvin Griffiths. *Emeritus Professor of Geography, University of Denver, Colo.*

Theodore Gregory Gronert (d. 1966). *Chairman, Department of History, Wabash College, Crawfordsville, Ind.*

Alberto Passos Guimarães (d. 1993). *Geography Editor, Enciclopédia Mirador Internacional, Rio de Janeiro.*

Bernard Victor Gutsell. *Emeritus Professor of Geography, York University, Toronto. Editor, Cartographica.*

LeRoy R. Hafen (deceased). *Professor of History, Brigham Young University, Provo, Utah, 1954–71. State Historian of Colorado, 1924–54.*

Daniel George Edward Hall (d. 1979). *Professor of the History of South-East Asia, University of London, 1949–59.*

J.M. Hall. *Former Lecturer in Geography, Queen Mary College, University of London.*

Ray Hall. *Senior Lecturer in Geography, Queen Mary and Westfield College, University of London.*

Robert Burnett Hall (d. 1975). *Colonel, U.S. Army. Professor of Geography, University of Michigan, Ann Arbor; Director, Center for Japanese Studies, 1947–57.*

Louis-Edmond Hamelin. *Geographer, University of Quebec at Trois-Rivières; Rector, 1978–83.*

Edward Hamming. *Former Professor of Geography, Augustana College, Rock Island, Ill.*

John W. Hanson. *Former Professor of Geography, Michigan State University, East Lansing.*

F. Kenneth Hare. *Chancellor, Trent University, Peterborough, Ont. University Professor Emeritus of Geography, University of Toronto.*

George Dewey Harmon. *Emeritus Professor of American History, Lehigh University, Bethlehem, Pa.*

John Lauren Harr. *Emeritus Professor of History, Northwest Missouri State University, Maryville.*

Ronald James Harrison-Church. *Emeritus Professor of Geography, London School of Economics and Political Science, University of London.*

Mary Harvey. *Lecturer in Geography, Goldsmiths' College, University of London.*

Maria van Hasselt. *Former Curator, History of The Hague Department, Municipal Museum of The Hague.*

Raymond Hastey. *Teacher, Lycée, Cherbourg, Fr.*

Athan(assios) D. Hatzikakidis. *General Director, Institute of Oceanographic and Fisheries Research, Athens.*

Richard Walter Haupt. *Former Director, The Cincinnati Historical Society, Ohio.*

H. Bowman Hawkes. *Emeritus Professor of Geography, University of Utah, Salt Lake City.*

Hubert Howard Hawkins. *Director, Indiana Historical Bureau and Indiana Historical Society, Indianapolis, 1953–76.*

Pauline Heaton. *Former Acting Archivist, Bermuda.*

Hermann-Heino Heine. *Taxonomic Botanist, Kew Gardens, London.*

Herbert Lynn Heller. *Emeritus Professor of Education, Baldwin-Wallace College, Berea, Ohio.*

Walter Brookfield Hendrickson. *Emeritus Professor of History, MacMurray College, Jacksonville, Ill.*

Henri Henneguelle. *Mayor of Boulogne, Fr., 1945–47; 1953–77.*

Roger Chatsey Heppell. *Professor of Geography, State University of New York College at Cortland.*

Thomas Herdman (d. 1970). *Senior Lecturer in Geography and Education, Training College, Dudley, Eng.*

Herman Heupers. *Manager, Public Relations Office, Enschede, Neth.*

Sanford Wilson Higginbotham. *Professor of History, Rice University, Houston, Texas. Editor, Journal of Southern History.*

Ernest Gotthold Hildner, Jr. *Professor of History, Illinois College, Jacksonville, 1938–72.*

Marie-Elisabeth Hilger. *Professor of Social and Economic History, Institute for Social and Economic History, University of Hamburg.*

Dorothy Hill. *Research Professor Emeritus of Geology, University of Queensland, St. Lucia, Brisbane, Australia.*

Neal O. Hines. *Former Staff Associate, Laboratory of Radiation Biology, University of Washington, Seattle.*

Mark David Hirsch (d. 1989). *Professor of History, Bronx Community College, City University of New York, 1959–75.*

Edward Henry Hobbs. *Dean of Arts and Sciences, Auburn University, Ala.*

Walter Hoffelner. *Official of the Municipal Council, Steyr, Austria.*

Hans Högn (d. 1980). *Mayor of Hof, W.Ger.*

Stanley Charles Holliday. *Former Chief Librarian, Kensington and Chelsea Public Libraries, London.*

Madhusudan Shriniwas Honrao. *Former Reader and Head, Department of Geography, Karnatak University, Dharwar, India.*

Reginald Horsman. *Distinguished Professor of American History, University of Wisconsin, Milwaukee.*

Jack Luin Hough. *Emeritus Professor of Meteorology and Oceanography and of Geology and Mineralogy, University of Michigan, Ann Arbor.*

James Houston. *Former Chancellor, Regent College, Vancouver, B.C.*

Henry Forbush Howe, M.D. *Author of Salt Rivers of the Massachusetts Shore; Massachusetts: There She Is—Behold Her; and others.*

Lewis Grenfell Huddy. *Former Town Clerk, London Borough of Hackney, Eng.*

Jean Hugli. *Teacher, Technical College, Lausanne, Switz.*

Robert Edward Huke. *Emeritus Professor of Geography, Dartmouth College, Hanover, N.H.*

Arjuna Hulugalle. *Publishing company director. Coeditor and cotranslator of Reiseführer von Sri Lanka ("Guide to Ceylon").*

Herbert A.J. Hulugalle. *Chairman, Advisory Committee, National and Grindlays Bank, Sri Lanka Branch, Colombo. Ambassador of Ceylon to Italy, 1954–59.*

John Owen Hunt. *Former Clerk, Urban District Council, Matlock, Eng.*

Thomas John Hunt. *Chairman, Somerset Archaeological Society and Somerset Record Society, Eng.*

J.O. Hunwick. *Professor of History, Northwestern University, Evanston, Ill.*

Jacob C. Hurewitz. *Professor of Political Science, Columbia University.*

Georg Illert. *Former Director, State Library, Archives, and Museum, Worms, W.Ger.*

Giuseppe Imbo (d. 1980). *Professor of Earth Sciences, University of Naples. Director, Vesuvian Observatory, Naples, 1935–70.*

Robert Henry Irrmann. *Emeritus Professor of History, Beloit College, Wis.; Archivist, 1953–80.*

William Harold Irvine. *Secretary General, Nigerian Tourist Association, Lagos, 1963–68.*

Norman Itzkowitz. *Professor of Near Eastern Studies, Princeton University.*

John David Ives. *Professor and Chairman, Department of Geography, University of California, Davis.*

Phil Rowland Jack. *Former Professor of Social Sciences, California University of Pennsylvania.*

Orville John Jaebker. *Emeritus Professor of History, University of Evansville, Ind.*

Karel Frederik Otto James. *President, Central Committee of Regional Gasboards, Amerongen. Former Burgomaster, Gouda, Neth.*

Preston E. James (d. 1986). *Maxwell Professor of Geography, Syracuse University, N.Y., 1964–70.*

Neil L. Jamieson. *Program Officer, Winrock International Institute for Agricultural Development, Hanoi, Vietnam. Senior Associate, Indochina Institute, George Mason University, Fairfax, Va.*

Brian Michael Jenkins. *Senior Staff Member, The RAND Corporation, Santa Monica, Calif.*

John Leonard Jennewein (d. 1968). *Associate Professor of History, Dakota Wesleyan University, Mitchell, S.D.*

Dorothy O. Johansen. *Emeritus Professor of History, Reed College, Portland, Ore.*

John Edwin Johns. *President, Furman University, Greenville, S.C.*

Bert Willard Johnson (d. 1992). *County Manager, Arlington, Va., 1962–76. City Manager, Evanston, Ill., 1953–62.*

William Stephen Kwesi Johnston (Nana Amoah IV). *Former Vice-Chairman, Ghana Boy Scouts Association, Central Region. Senior Divisional Chief of Ognaa (Cape Coast) Traditional Area; Local Court Magistrate, Cape Coast, Ghana, 1960–66.*

Clarence F. Jones (d. 1991). *Professor of Geography, Northwestern University, Evanston, Ill., 1945–61.*

Lewis Pinckney Jones. *Kenan Professor Emeritus of History, Wofford College, Spartanburg, S.C.*

Meirion T. Jones. *Principal Scientific Officer, Marine Information and Advisory Service, Institute of Oceanographic Sciences, Birkenhead, Eng.*

Robert Leslie Jones (d. 1989). *Professor of History, Marietta College, Ohio, 1945–72.*

Ronald Jones. *Reader in Geography, Queen Mary and Westfield College, University of London.*

Stanley Llewellyn Jones. *Emeritus Professor of History, University of North Carolina at Greensboro.*

Weymouth Tyree Jordan (d. 1968). *Professor, 1949–68, and Head of the Department of History, 1955–68, Florida State University, Tallahassee.*

Derrick Neville Edwin Kain. *Industrial and Business Editor, Natal Witness, Pietermaritzburg, S.Af.*

James Samuel Kaleem. *Former Principal Education Officer, Ministry of Education, Tamale, Ghana.*

Samuel Richey Kamm (deceased). *Professor of History and Social Science, Wheaton College, Ill., 1942–73.*

Otto Kandler. *Professor of Geography, Johannes Gutenberg University of Mainz, Ger.*

Suk Oh Kang. *Former Professor of Geography, Ewha Woman's University, Seoul.*

Helene Juliet Kantor (d. 1993). *Professor of Near Eastern Art and Archaeology, University of Chicago, 1963–89.*

John Haskell Kemble (d. 1990). *Professor of History, Pomona College, Claremont, Calif., 1950–77.*

Peter Alexander Kennedy. *Former County Archivist, Devon County Council, England.*

Joan Margaret Kenworthy. *Principal, St. Mary's College; Honorary Lecturer in Geography, University of Durham, Eng.*

Hendrik Jakob Keuning. *Former Professor of Economics and Social Geography, State University of Groningen, Neth.*

Huỳnh Kim Khánh. *Research Fellow, Institute of Social Studies, The Hague.*

Rudolf Kiepeke. *Publisher of Die Warte, Paderborn, Ger.*

Harold Godfrey King. *Librarian and Information Officer, Scott Polar Research Institute, University of Cambridge.*

Spencer Bidwell King, Jr. (d. 1977). *Professor of History, Mercer University, Macon, Ga., 1948–73.*

George Kish (d. 1989). *Professor of Geography, University of Michigan, Ann Arbor.*

Anna Alekseyevna Klyukanova. *Senior Scientist, Institute of Geography, Russian Academy of Sciences, Moscow.*

Anton C.F. Koch. *Former Town Archivist and Librarian, Deventer, Neth.*

John Kolars. *Professor of Geography, University of Michigan, Ann Arbor.*

Rudolf Koller. *Director of the Municipal Department of Culture and the Arts, Ingolstadt, Ger.*

John G.J. Koreman. *Chief Assistant, Municipal Record Office, Maastricht, Neth.*

Dimitar Konstantinov Kossev. *Editor in Chief, Bulgarian Historical Review, Rector, University of Sofia, 1962–67.*

Hans-Joachim Kramm. *Professor of Economic Geography, College of Education, Potsdam, Ger.*

Walter Kranz. *Former Director, Press and Information Office of the Liechtenstein Government.*

Hermann Kresse. *Editor in Chief, Saarland Edition, Rhein-Saar-Spiegel. Reporter, Saarbrücker Zeitung.*

Werner Kugler (d. 1973). *Burgomaster of Schleswig, W.Ger.*

Werner Th. Kuhn (d. 1973). *Professor of Geography, Staedisches Gymnasium, Bern. Lecturer, State College, Bern.*

Wiebren Hendrik Kuipers. *Public Relations Officer, Community of Leeuwarden, Neth.*

Eeva-Sinikka Kurikka. *Chief Correspondent, Werner Söderström Osakeyhtiö, Publishers, Helsinki.*

Wilhelm von Kürten. *Professor of Geography, University of Wuppertal, Ger.*

Pieter Th.J. Kuyser. *Keeper of Municipal Records, 's Hertogenbosch, Neth.*

Nikolay Timofeyevich Kuznetsov. *Chief Research Associate, Laboratory of Mountain Geosystems, Institute of Geography, Russian Academy of Sciences, Moscow.*

Alexander Atta Yaw Kyerematen. *Director, Ghana National Cultural Centre, Kumasi.*

Howard Lackman. *Professor of History, University of Texas at Arlington.*

Ernest McPherson Lander, Jr. *Alumni Professor of History, Clemson University, S.C.*

Elfrieda Wilhelmina Henrietta Lang. *Curator of Manuscripts, Lilly Library, Indiana University, Bloomington, 1965–74.*

Robert Millard Langdon (d. 1967). *Associate Professor of History, Civilian Faculty, U.S. Naval Academy.*

Richard W. Lariviere. *Assistant Professor of Sanskrit, University of Texas at Austin.*

Helge Larsen. *Minister of Education, Danish Government, 1968–71.*

François Lasserre (d. 1989). *Professor of Classical Greek, University of Lausanne, Switz.*

Geoffrey Charles Last. *Former Adviser, Imperial Ethiopian Ministry of Education and Fine Arts, Addis Ababa.*

Louis-Noël Latour. *Curator, Museum of the Hôtel-Dieu, Beaune, Fr.*

Keith Eric Lauder. *Former Town Clerk, London Borough of Barking, Eng.*

Heinz Lauenroth. *Chief City Official and Director, Cultural and Sport Department, Hanover, Ger.*

Joseph J. Lauer. *Africana Librarian, University of California, Los Angeles.*

J.H.G. Lebon (d. 1969). *Reader in Geography, School of Oriental and African Studies, University of London, 1966–69.*

Enoch Lawrence Lee. *Emeritus Professor of History, The Citadel, Charleston, S.C.*

Roger Kendrick Lee. *Lecturer in Geography, Queen Mary College, University of London.*

Aureliano Leite (d. 1976). *President of the São Paulo Historical and Geographical Institute. Member of the São Paulo Academy of Letters. Member of the Brazilian Historical and Geographical Institute.*

Celso de Paiva Leite. *Professor, Centre of Applied Social Sciences, Federal University of Paraíba, João Pessoa, Braz.*

Robert Lemaire. *Librarian of the Municipal Library, Beauvais, Fr.*

Walter John Lemke (d. 1968). *Professor of Journalism, University of Arkansas, Fayetteville.*

John Herbert Le Patourel (d. 1981). *Research Professor of Medieval History, University of Leeds, Eng., 1970–74.*

Edith Veronica Lewis. *Reference Librarian, Finsbury Library, London Borough of Islington, Eng.*

George Knowlton Lewis. *Emeritus Professor of Geography, Boston University.*

Reginald George Lickfold. *Former Town Clerk, Weston-super-Mare, Eng.*

George Lighton. *Principal of Stevenage College of Further Education, Stevenage, Eng. Former Senior Geography Master, Queen's College, Georgetown, British Guiana.*

José Lourenço de Lima. *Professor of Romance Languages, Federal University of Pernambuco, and Catholic University of Pernambuco, Recife, Braz.*

Miguel Alves de Lima. *Professor of Physical Geography, State University of Rio de Janeiro; former Director, Earth Sciences Institute.*

Steffen Linvald. *Director of Copenhagen City Museum, 1952–79.*

Aleksandr Petrovich Lisitsin. *Former Head, Laboratory of Physical Methods of Research, Institute of Oceanology, Academy of Sciences of the U.S.S.R., Moscow.*

Georges Livet. *Professor of Modern History, University of Strasbourg II, Fr.*

Donald Lloyd. *Former Deputy Clerk, Urban District Council of Winsford, Eng.*

Seton H.F. Lloyd (d. 1996). *Professor of Western Asiatic Archaeology, University of London, 1962–69.*

W. Duane Lockard. *Professor of Political Science, Princeton University.*

M. John Loeffler. *Emeritus Professor of Geography, University of Colorado, Boulder.*

Julius Loennechen. *British Vice-Consul, Kristiansund, Nor.*

Rayford Whittingham Logan (d. 1982). *Professor of History, Howard University, Washington, D.C., 1938–72.*

Richard F. Logan (d. 1994). *Professor of Geography, University of California, Los Angeles.*

Alan R. Longhurst. *Director-General, Atlantic Ocean Science and Surveys, Bedford Institute of Oceanography, Dartmouth, N.S.*

Richard Lowitt. *Former Professor of History, University of Kentucky, Lexington.*

Myron Harper Luke. *Emeritus Professor of History, C.W. Post College, Long Island University, Greenvale, N.Y.*

Gustav Johannes Luntowski. *Town Archivist, Dortmund, Ger. Former Town Archivist and Chief Librarian, Lüneburg, W.Ger.*

Anthony Thornton Luttrell. *Former Assistant Director, British School at Rome.*

Vasily Yosifovich Lymarev. *Professor of Geography, Kaliningrad State University, Russia.*

Charles Maas. *Director, Cultural Office, Villach, Austria.*

John Morris McClelland, Jr. *Former Editor and Publisher, Longview (Wash.) Daily News.*

Margaret McDerby. *Librarian in Charge, Reference and Museum Services, London Borough of Barnet, Eng.*

William Duff Mackay. *Town Clerk and Treasurer, Richmond, S.Af. Town Clerk, Ladysmith, S.Af., 1946–61.*

Henry Miller Madden. *Adjunct Professor of Bibliography, California State University, Fresno; Librarian, 1949–79.*

Desiderio Maggioni. *Former Member for Milano-Pavia, Chamber of Deputies, Italy.*

William Richard Maidment. *Former Borough Librarian, London Borough of Camden, Eng.*

Vasile Malinschi. *Governor, National Bank of the Socialist Republic of Romania, 1963–77. Member, Section of Economics, Juridical, and Sociological Sciences, Romanian Academy, Bucharest.*

Ulrich W. Mammey. *Research Associate, Federal Institute for Population Research, Wiesbaden, Ger. Associate of the Geographical Institute, Johann Wolfgang Goethe University of Frankfurt.*

Gordon Manley (d. 1980). *Professor of Environmental Sciences, University of Lancaster, Eng., 1964–68.*

Luis Marden. *Former Chief, Foreign Editorial Staff, National Geographic Magazine, Washington, D.C.*

Aleksandr Mefodyevich Marinich. *Scientific Counselor of Administration, Institute of Geography, Ukrainian Academy of Sciences, Kiev. President, Ukrainian Geographical Society.*

Albert John Marino. *Assistant City Editor, New Britain (Conn.) Herald.*

Nemesio Marqués. *General Secretary to the Bishop of Urgel, Coprinco of Andorra.*

Hendrik Michiel Martens. *Burgomaster, Ermelo, Neth., 1938–62.*

Jean Martin-Demézil. *Archivist, Département of Loir-et-Cher, Fr., 1941–78.*

Kenneth Mason (d. 1976). *Lieutenant Colonel, Royal Engineers. Professor of Geography, University of Oxford, 1932–53.*

Philip Parker Mason. *Professor of History, Wayne State University, Detroit.*

Matsui Taketoshi. *Former Professor of Human Geography, Nagoya University, Japan.*

Eberhard Matthes. *Former Town Archivist, Eisenach, E.Ger.*

John E. Mawby. *Associate Professor of Geology, California State University, Fresno.*

William Richard Mead. *Emeritus Professor of Geography, University College, University of London.*

Howard Brett Melendy. *Professor of History, San Jose State University, Calif.*

Ralph Robertson Mellon, M.D. (deceased). *Director, Institute of Pathology, Western Pennsylvania Hospital, Pittsburgh, 1927–53.*

Roy E.H. Mellor. *Emeritus Professor of Geography, University of Aberdeen, Scot.*

Alberto Mennella. *Archivist and Departmental Head, Municipality of Torre del Greco, Italy.*

Jean Michel Mercadier. *Director, Honoré de Balzac College of Secondary Education, Albi, Fr.*

(Ethel) Doris Mercer. *Head Archivist, Greater London Council.*

Horst Messerschmidt. *Burgomaster of Bernburg, Ger.*

Patricia Meyer. *Reference Librarian, Borough of Wandsworth, Eng.*

Dorothy Middleton. *Assistant Editor, Geographical Journal, 1953–71. Author of Baker of the Nile and others.*

R.E. Millard. *Former Clerk of the Peace and Clerk of the County Council, Buckinghamshire, Eng.*

Maynard Malcolm Miller. *Professor of Geology; Emeritus Dean, College of Mines and Earth Resources; Director, Glaciological and Arctic Sciences Institute, University of Idaho, Moscow.*

Paul Eugene Million, Jr. *Associate Professor of History, Purdue University, West Lafayette, Ind.*

Norah Mitchell. *Teacher at the Kodai School, Madurai District, Tamil Nadu, India.*

Mario Modiano. *Athens Correspondent, The Times (London).*

Maurice P. Moffatt. *Former Professor and Chairman, Department of Social Studies, Montclair State College, N.J.*

Jay Monaghan (d. 1981). *Consultant, Wyles Collection of Lincolnia and Western Americana, University of California, Santa Barbara. State Historian of Illinois, 1946–51.*

Robert Scott Monahan. *Former Forester and Manager of Outing Properties, Dartmouth College, Hanover, N.H.*

Annie Monginoux. *Librarian, Saint-Étienne Municipal Library, Fr.*

Francis John Monkhouse (d. 1975). *Professor of Geography, University of Southampton, Eng., 1954–66.*

Powell A. Moore (d. 1967). *Professor of History, Indiana University, Bloomington.*

Amélia A. Norgueira Moreira (deceased). *Professor of Geography, Federal University of Ceará, Fortaleza, Braz.*

Gladys Margery Morris. *Former Clerk, Ashburton Urban District Council, Eng.*

James Davidson Morrison. *Emeritus Professor of History, Southeastern State College, Durant, Okla.*

Ralph Ernest Morrow. *Professor of History, Washington University, St. Louis, Mo.*

Richard Lee Morton (d. 1974). *Professor of History, College of William and Mary, Williamsburg, Va., 1921–59.*

Heinz Motel. *Chief of Tourist Office, Göttingen, Ger.*

Malcolm Herbert Moule. *Professor of English History, University of the Pacific, Stockton, Calif.*

Alan Bertram Mountjoy. *Reader in Geography, Bedford College, University of London.*

Pieter Mourik. *Municipal Economic Adviser, Haarlem, Neth.*

Ottheinz Münch. *City Archivist, Kaiserslautern, Ger.*

John A. Munroe. *H. Rodney Sharp Professor Emeritus of History, University of Delaware, Newark.*

Aleksey Mikhaylovich Muromtsev. *Head, Space Research Laboratory, Marine Fisheries and Oceanography Institute, Moscow.*

Keith A. Murray. *Emeritus Professor of History, Western Washington University, Bellingham.*

Maurice Murzeau. *Director, Information Bureau, Angers, Fr.*

Alice F.A. Mutton (d. 1979). *Reader in Geography, Queen Mary College, University of London.*

Geoffrey Myers. *Former United Nations Correspondent, The London Daily Telegraph.*

Merle Wentworth Myers. *Emeritus Professor of Geology and Geography, Mississippi State University, Starkville.*

Sarah K. Myers. *Editor, The Geographical Review, 1973–78.*

Dnyandeo Giraji Narkhede. *Lecturer in Geography, Nagpur Mahavidyalaya, Nagpur University, India.*

Maria Teresa Anzidei Natali. *Teacher of Literature, Scuola Media Statale Petrocchi, Rome.*

Pedro Neiva de Santana. *Governor of Maranhão State, 1971–75. Former Rector, University of Maranhão, São Luis, Braz.*

Philippus Rudolph Nell. *Town Clerk, Boksburg, S.Af.*

Werner Neugebauer. *Former Director, Office for Prehistory and Early History, Office of the Mayor of Lübeck, W.Ger.*

Edward J. Nichols. *Emeritus Professor of English Composition, Pennsylvania State University, University Park.*

Joan Nicklin. *Freelance writer on geography.*

Henri Nicolai. *Emeritus Professor of Human Geography, Free University of Brussels.*

Willem Petrus van Niekerk. *Town Clerk and Treasurer, Jagersfontein, S.Af.*

Ursula Niemann. *Curator of Bielefeld Town Archives, Ger.*

Yevgeny Gurevich Nikiforov. *Deputy Director of Science, Arctic and Antarctic Scientific Research Institute, St. Petersburg.*

Nancy Paine Norton. *Professor of History, Wheaton College, Norton, Mass.,*

Boniface Ihewunwa Obichere. *Professor of History, University of California, Los Angeles.*

John Gerard O'Connor. *Former Instructor of Art, University of New Mexico. Director, Gallup Museum of Indian Arts and Crafts, N.M., 1956–60.*

Andrew Charles O'Dell (d. 1966). *Professor of Geography, University of Aberdeen, 1951–66.*

Herman Martinus Oldenhof. *Burgomaster of Ede, Neth., 1952–62.*

Kjeld Olsen. *Municipal Official of Randers, Den.*

Frederick Irving Olson. *Professor of History, University of Wisconsin, Milwaukee.*

Simeon Hongo Ominde. *Professor of Geography; Director, Population Studies and Research Institute, University of Nairobi, Kenya.*

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